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TWENTY-NINTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO.

1898.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO.
WARWICK BRO'S & RUTTER, PRINTERS, ETC., 68 AND 70 FRONT STREET WEST.
1899.

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WILLIAM HAGUE HARRINGTON, F.R.S.C.
President of the Entomological Society of Ontario, 1893-5

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JOHN DEARNESS, I.P.S.
President of the Entomological Society of Ontario, 1895-7.

UNIV. OF CALIFORNIA

TWENTY-NINTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO,

1898.

To the Honorable John Dryden, Minister of Agriculture.

SIR,—I have the honor to present herewith the twenty-ninth annual report of the Entomological Society of Ontario. It contains an account of the proceedings at our annual meeting, which was held in the City of Montreal, on the 8th and 9th of November last. The change from London, the usual place of meeting and the headquarters of the society, was made in order that the members generally might join in the celebration of the twenty-fifth anniversary of the formation of the Montreal Branch. The report includes the financial statement of the Treasurer and the reports of the various sections, branches and officers of the society, as well as the papers and addresses delivered during the course of the meeting.

The *Canadian Entomologist*, the monthly magazine published by the society, has now completed its thirtieth volume and begun the issue of the thirty-first. The volume contains a large number of valuable original papers contributed by the most eminent writers in this department of science in Canada and elsewhere. Great attention, it may be observed, has been paid to scale insects and a great many new species from different parts of North America have been described.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,
Editor.

Trinity College School,
Port Hope.

OFFICERS FOR 1898-9.

President	HENRY H. LYMAN, M.A	Montreal.
Vice-President	REV. T. W. FYLES, D.C.L., F.L.S.	South Quebec.
Secretary	W. E. SAUNDERS	London.
Treasurer	J. A. BALKWILL	London.
Directors :		
Division No. 1	W. H. HARRINGTON, F.R.S.C.	Ottawa.
" 2	J. D. EVANS	Trenton.
" 3	ARTHUR GIBSON	Toronto.
" 4	A. H. KILMAN	Ridgeway.
" 5	R. W. RENNIE	London.
Directors ex-Officio (ex-Presidents of the Society)	PROF. WM. SAUNDERS, LL.D., F.R.S.C., F.L.S., Director of Experimental Farms	Ottawa.
	REV. C. J. S. BETHUNE, M.A., D.C.L., F.R.S.C., Head Master Trinity College School	Port Hope.
	JAMES FLETCHER, LL.D., F.R.S.C., F.L.S., Entomologist and Botanist, Experimental Farms	Ottawa.
	JOHN DEARNESS, I.P.S.	London.
Director Ex-officio (Ontario Agricultural College)	PROF. Wm. LOCHHEAD	Guelph.
Librarian and Curator	J. ALSTON MOFFAT	London.
Auditors	J. H. BOWMAN and W. H. HAMILTON	London.
Editor of the "Canadian Entomologist"	REV. DR. BETHUNE	Port Hope.
Editing Committee	DR. J. FLETCHER	Ottawa.
	H. H. LYMAN	Montreal.
	J. D. EVANS	Trenton.
	W. H. HARRINGTON	Ottawa.
	JAMES WHITE	Snelgrove.
Delegate to the Royal Society	REV. DR. FYLES	South Quebec.
Delegates to the Western Fair	J. DEARNESS and W. E. SAUNDERS	London.
Committee on Field Days	DR. WOOLVERTON, MESSRS. BALKWILL, BOWMAN, ELLIOTT, LAW, PERCIVAL, RENNIE, SAUNDERS, and SPENCER	London.
	DR. HOTSON	Parkhill.
Library and Rooms Committee	MESSRS. BALKWILL, BETHUNE, DEARNESS, MOFFAT, and SAUNDERS.	

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1898.

The thirty-fifth* annual meeting of the Entomological Society of Ontario was held at Montreal, in the Museum of the Natural History Society, on Tuesday and Wednesday, November 8th and 9th, in order that the members might join in the celebration of the twenty-fifth anniversary of the formation of the Montreal Branch. At the request of the President, Mr. Henry H. Lyman, the chair was occupied by the Rev. Dr. Bethune, of Port Hope.

The meeting was called to order at 2-30 p.m. on Tuesday, when the following members were present: Dr. Wm. Saunders, Director, and Dr. James Fletcher, Entomologist and Botanist, Experimental Farms, Ottawa; Messrs. John Dearness and W. E. Saunders (Secretary) London; Mr. Arthur Gibson, Toronto; Rev. C. J. S. Bethune, Port Hope; Mr. J. D. Evans, Trenton; Rev. Dr. Fyles, South Quebec; Messrs. H. H. Lyman, A. F. Winn, J. T. Hausen, Lachlan Gibb, M. Waring Davis, G. C. Dunlop, D. Brainerd, A. E. Norris, H. Brainerd, J. B. Williams, Chas. Stephenson, Rev. Dr. Campbell, and others, Montreal.

The President read letters expressing regret at their inability to attend the meeting, from the following prominent American entomologists: Dr. L. O. Howard, Director of the Division of Entomology, U.S. Department of Agriculture, Washington, D.C.; Rev. Dr. W. J. Holland, Chancellor of the Western University of Pennsylvania, Allegheny, Pa.; Professor F. M. Webster, Wooster, Ohio; Professor M. V. Slingerland, Cornell University, Ithaca, N.Y.

The report of the Librarian and Curator, Mr. J. Alston Moffat, was read by the Chairman, showing 47 additions to the Library, which make the total number of volumes 1,553, and satisfactory work in the increase of the collections.

The Chairman next read the report of the Treasurer, and explained that the large balance in hand on the 1st of September last, when the books were closed, would be greatly reduced by the payments that became due between that date and the end of the year. A discussion upon cork and pins then ensued. Dr. Fyles exhibited a sample of a substitute for cork that had been placed upon the market. Dr. Fletcher enquired why the quality of the cork recently supplied by the Society was so poor. The Secretary replied that he thought a better quality could be procured by paying a higher price for it. Dr. Fletcher considered that we should have the best obtainable, as the present supply was unsatisfactory. Mr. Lyman exhibited some specimens of English-made steel pins, both gilt and black enamelled, and the Secretary was authorized to procure a moderate supply in order that the members might use them if they wished.

The Report of the Botanical Section was then read by the Chairman. Dr. Fletcher made enquiries as to *Cuscuta epithymum*, a dodder which has been found upon clover in the County of Middlesex. Mr. Dearness assured him that it had been correctly identified. He then said that it was a true annual, growing from seed each year.

The Report of the Microscopical and Geological Sections were next read by the Chairman, who remarked that London had become a headquarters of scientific research for the western peninsula of Ontario, in consequence of the good work done by the Society and its sections. It was certainly an unique matter that so many branches devoted to different departments of science should be affiliated together in connection with the Entomological Society of Ontario.

The Reports of the local Branches of the Society were next read; that of the Montreal Branch by its Secretary, Mr. Lachlan Gibb; the report of the Toronto Branch also by its Secretary, Mr. Arthur Gibson; and the report of the Quebec Branch by its President, the Rev. Dr. Fyles. These reports all gave evidence of much good work accomplished, and steady progress in interest and numbers.

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* By an error it is stated in the last annual Report that "the thirty-fifth annual meeting" was held in 1897. As the Society was founded in 1863, this is manifestly a mistake.

1

The Report of the Delegate to the Royal Society of Canada was read by Mr. John D. Evans, of Trenton, who represented the Entomological Society at the last annual meeting in May. It contained a brief record of the work that had been done during the previous year.

The Report of the Council of the Society was read by the Secretary, Mr. W. E. Saunders, of London, as follows:

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario submits herewith its Annual Report for the year 1897–8.

The Council is pleased to be able to report that the three Branches of the Society in Montreal, Toronto, and Quebec, are in an active and vigorous condition, much good work having been done in all of them during the past season. The membership of the Branches, the meetings held, and the particulars of their work will be found in their respective reports.

The twenty-eighth annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario, at the end of December last, and was printed and distributed at the close of the session of the Legislature. It contained one hundred and four pages, and was illustrated with fifty-six wood-cuts and two full-page plates, in addition to an account of the proceedings at the last annual meeting. The report contains the annual address of the President, Mr. John Dearness, and the following valuable and interesting papers: "The Locusts of the Bible," by Rev. T. W. Fyles; "A Study of the Gryllidæ (Crickets)," by Mr. Wm. Lochhead; "The Value of Systematic Entomological Observations" and "Protective Resemblances," by Mr. J. A. Moffat; "On Butterfly Books, by Mr. H. H. Lyman; "Some Household Pests," by Rev. C. J. S. Bethune; "On the Entomological Results of the Exploration of the British West India Islands by the British Association for the Advancement of Science," by Dr. L. O. Howard; "The Work Against the Gypsy Moth, 1897," by Mr. A. H. Kirkland; "Notes on the Insects of the Year," by Messrs. Harrington, Bethune, Moffat, Fyles, Gibson and Grant; "The San Jose Scale," by Dr. James Fletcher; and a short account of the proceedings at the annual meeting of the Association of Economic Entomologists. The report on the whole contains a larger number than usual of distinctly practical and popular papers that cannot fail to be of great value to the community. These papers were specially prepared by members of the Society in order to afford useful information on a great variety of insects, free as far as possible from scientific and technical language, to farmers, gardeners, fruit-growers, and others affected by the ravages of destructive insects.

The *Canadian Entomologist*, the monthly magazine published by the Society, completed its twenty-ninth volume in December last. Eleven numbers of the thirteenth volume have been issued; they contain 296 pages, and are illustrated with six full-page plates, one of which is colored, and a number of original wood-cuts. Among the many valuable papers may be mentioned a series of articles on "The Classification of the Horntails and Saw-flies of the World," by Mr. William H. Ashmead, and "The Descriptions of a Number of New Species of Scale Insects," by Mr. T. D. A. Cockerell, and others.

Friends of the Society will note with pleasure, that one of our officers, Mr. Wm. Lochhead, has been appointed to the important position of Professor of Biology, in the Ontario Agricultural College, at Guelph. The College is to be congratulated on having made so wise a choice in filling the vacant position.

Since our last meeting, great efforts have been made by the Legislature of Ontario and the Federal Government, to eradicate such colonies of the San Jose Scale as have been found in Canada, and to prevent further introductions of this injurious pest. In our last report will be found the Federal and Provincial Acts bearing upon this subject. These Acts have been vigorously enforced during the past season, and orchards, in districts where the Scale has been found, have been subjected to a rigid inspection. Exceptional efforts have been made by the Provincial Government, to wipe out all traces of this pest, the increase of which, as everyone who understands the matter knows, would be a national calamity.

The members of the Council are gratified to know that the excellent work of one of its oldest and most esteemed members has been recognized by the University of Bishop's College, Lennoxville, Que., the Rev. Thomas W. Fyles having received, at its hands, the degree of D.C.L. The excellent work of Dr. Fyles in encouraging the public taste for Entomology, by his popular papers on insects, and by the formation, in 1897, of the Quebec Branch of the Entomological Society is well known to all our members.

The Council profoundly regrets the loss by death of Prof. Panton, of the Ontario Agricultural College, at Guelph, who at the time of his decease was Vice-President of the Society. He was highly esteemed and respected by the members, both for the efficient assistance he has rendered the cause of Practical Entomology in Canada, and the agreeable and courteous manner which ever characterized his intercourse with all who came in contact with him.

The Council has much pleasure in stating that entomological books can now be imported into Canada free of all Customs duty, and that this concession was obtained through the representations of our Society. Early in the year, the President called the attention of the Council to the fact, that under item No. 464 of the tariff, books upon the application of science to industries of all kinds could be imported free of duty, and suggested that an effort should be made to secure the placing in the same category books upon entomology, on account of the close connection between that science and the successful prosecution of agriculture. This was unanimously approved by the Council and a Committee consisting of the President and Drs. Bethune and Fletcher, was appointed to prepare a memorial to the Government. The memorial having been approved, was signed by the President and Secretary, and was duly forwarded to the Finance Minister on the eve of the introduction of the budget, but owing to the pressure of other business was held over until the prorogation of Parliament. It was referred to the Minister of Customs, who requested the President to furnish more information, and to submit samples of books. On this being done, the Hon. Mr. Patterson, at once decided that such books should be admitted free under the item above referred to.

The Society was represented at the meetings in Boston, in August last, of the Association of Economic Entomologists of North America, and the American Association for the Advancement of Science, by its President, Mr. Lyman and the Rev. Dr. Bethune.

The Council desires to express its entire satisfaction with the efficient manner in which the Librarian and Curator, Mr. J. Alston Moffat continues to discharge the duties of his offices.

All of which is respectfully submitted,

HENRY H. LYMAN,
President.

The adoption of the report of the Council was moved by Mr. Dearness, who also said that it would be interesting to have inserted in the report of the Montreal Branch, some details regarding their Saturday afternoon lectures for young people; upon being seconded by Mr. L. Gibb, the motion was put to the meeting and unanimously adopted.

there from the shales which extend as shoals far into Lake Huron. These concretions vary in size from a foot to five feet in diameter. Their composition is limestone, colored by bituminous matter. They are crystalline and radiate from a centre. They resemble fossilized wood. When exposed to the action of the air they usually divide through the centre forming hemispheres.

"As they are being wantonly destroyed by visitors there should be legislative protection provided for these curiosities as soon as possible.

"The shales here present a fine tesselated appearance. The vertical cleavage runs in parallel straight lines at different distances, and the general appearance is much the same as it would be had these shales been placed in position by skilled workmen. Quantities of pyrites are found in these shales. The iron oxidizing tinges with red the boulders along the shore.

"By decomposition of the shales, quantities of alum are produced. This the Indians, from time immemorable, have used as medicine and a commodity for barter. Many years ago fire raged among these shales and consumed a great part of the peninsula which previously had extended far into the lake."

Mr. Percival's report on the celestine grotto at Put-in-Bay:

"It having been reported to the section that a curious crystal cave had recently been discovered on an island at the western extremity of Lake Erie, I decided to visit it and report. The cave was discovered a year ago by workmen engaged in digging a well. At a depth of about twenty feet a fissure was discovered at one side of the well, and further excavation revealed a beautiful little cavern everywhere lined with crystalline strontium sulphate (celestine). The owner having lighted the well by electricity the effect is very fine. The crystals are rhombic, of a beautiful azure blue, and vary in size from one inch to twenty inches in transverse axis. As the cavern is everywhere lined by these crystals it may be considered a gigantic geode. The cave is semi-circular in form and about forty feet in perimeter. The arch of the roof however is low owing to the vast deposit of crystals, said to be more than twenty-two feet in thickness, on the floor of the grotto.

"Crevices at several points together with other indications lead to the opinion that this is only one of a series of similar caverns in that vicinity. The owner proposes to continue excavating during the ensuing winter, and probably next summer there will be several grottoes open to the inspection of visitors.

"Strontium is a somewhat rare mineral and occurs nowhere else in large quantity. The element was isolated about a century ago. It is whitish in color, oxidizes readily, decomposes water with explosive violence, and never occurs in organic bodies. It gives a remarkable band of light in the spectrum, by which it is readily detected. Strontium was named after Strontian, in Argyle, Scotland, where it is found as a carbonate. It is also found in Sicily in small quantity. Here however the quantity in sight is quite large. Sr. nitrate is used to give a crimson tint to a flame, and is the chief material used in making Bengal fire (red). Strontium salts are also used in sugar refining to hasten the crystallization of sugar."

Mr. Percival placed beautiful crystals in our geological cabinet in the Entomological Society's rooms, where they may be inspected at any time.

MR. SANGSTER'S REPORT ON ALVINSTON SHALES.

The outcrop measures 1,400 feet in length, and borings made at various points prove that the depth is sixty feet. The river has eroded the bed to a depth of about eight feet. The shales are similar to those exposed at Kettle Point, but contain no concretions. They are highly carbonaceous and contain much iron sulphide. The shales are capped by a stratum of clay forty feet in thickness.

Experiments made with this shale prove it to be a most valuable material for the manufacture of vitrified brick. A leading manufacturer of paving brick declared no better material for the purpose had hitherto been discovered on this continent. As a company is being formed to manufacture brick from these shales, it is hoped that soon they will rank among the developed economic products of this Province.

Mr. Sangster exhibited fine specimens of vitrified brick manufactured from these shales.

Mr. John Law, who spent some time among the Catskills, southern New York reported that veins of copper, also platinum, besides traces of gold and silver, had been discovered in these regions. He exhibited specimens of drift boulders from this location; gneiss appeared to be the predominating material. He also exhibited a photograph of a famous drift rock called Eagle Rock. He thinks that prospectors would find it a favorable field for exploration.

Mr. Goodburn visited Galt and reported as follows:

The rocks at Galt are dolomite (in some cases pure) and belong to the Guelph group. They vary in colour, from a dirty yellow to a beautiful grey (the grey being the lowest in the series), and are of a peculiar crystalline texture. They furnish excellent building stones. The Guelph group varies here in thickness from 90ft. to 160ft. The underlying mass is the Niagara group. The upper portions of strata are much broken up, and contained many specimens of the Megalomus Canadensis. This bed was about 15ft. thick. The lower beds were quite compact, and also contained many fossils. One Meg. Can. which I secured is perfect, six inches in length, and larger than any figured in Nicholson's Palæontology. I also found a very good specimen of Megalomus compressus four inches long and a little over one inch in thickness, a portion of the outer spiral and the whole of the inner cast of a Murchisonia Loganii. The quarry whence I obtained my specimens is near the Grand Trunk track, and about 200 yards from the Grand River.

The Chairman visited the oil fields at Dutton, Elgin Co., Ontario, and reported that the pioneer company operating there had seven producing wells.

Mr. Kirk reported on another new oil field situated in Sarnia Township, Lambton Co., Ontario. One company operating there had thirty producing wells scattered along a line about two miles in length. These produce from 15 barrels per day downwards. They propose to thoroughly develop this tract, and sink a well every 200 feet. The producing area is about one mile in width. Another company working in an adjoining neighbourhood have very recently obtained some good wells, one of which pumps 25 barrels a day. The producing wells are all situated along anti-clinal, which, however, does not appear at the surface, being deeply covered by clay. Oil is obtained here at a depth of about 475 feet. The borings pass through clay 100ft., hard rock 15ft., shale 150 ft., upper lime 15 ft., shale 150 ft., lower lime and sandstone about 45ft. In order to obtain oil each well must be torpedoed, the charge being from 20 to 50 quarts of nitroglycerine. These new oil fields seem to be a northwesterly extension of the petroleum oil belt. The oil is found along a line trending northwest and southeast.

GEO. KIRK,
Secretary.

THE REPORT OF THE MONTREAL BRANCH.

The 215th regular and 25th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held in the rooms of the Natural History Society of Montreal, on May 10th, 1898.

The following members were present: Messrs. H. H. Lyman (President), A. F. Winn (Vice-President), E. T. Chambers, J. B. Williams, Dwight Brainerd, L. Reford, C. Stevenson, G. A. Moore, and L. Gibb; visitor, Mr. M. Waring Davis.

The chair was taken by the President, and the minutes of the previous meeting were read and confirmed, also the last annual report.

The President then submitted the following report of the Council for the past year:

In presenting their twenty-fifth annual report the Council have much pleasure in being able to congratulate the Branch upon having enjoyed a continuous and fairly prosperous existence for a quarter of a century. This, in view of the small number interested in the pursuit of this particular branch of science, coupled with the fact that in this country almost everyone has to work for a living, is, we think, a highly creditable showing.

During the season eight meetings have been held, at one of which we had the pleasure of the attendance of Dr. Fletcher, and at another of that of Rev. Mr. Fyles, and the following papers were read:

Annual address of the President.

Notes on the Collecting Season of 1897—Dwight Brainerd.

On the Food of the common Grass Snake—J. B. Williams.

A late Autumn Ramble on the Mountain—A. F. Winn.

On the Mounting of Lepidoptera—H. H. Lyman.

The San Jose Scale—Dr. James Fletcher.

Further notes on the Genus Chionobas—H. H. Lyman.

Our books and original papers—A. F. Winn.

Our native Pieridæ, a theory—Dwight Brainerd.

Introduction to the Classification of Insects—Rev. T. W. Fyles.

An Arctian: what is it?—Rev. T. W. Fyles.

Life History of Tæniocampa alia, Gn—Rev. T. W. Fyles.

The Dytiscidæ—A. F. Winn.

During the season a number of our members again took part in the course of short lectures to young people on Saturday afternoons at the Natural History Museum. This work is now fairly established, and should be productive of good results in the future.

Our small library, which had suffered greatly in the past through the Branch having no permanent quarters, has received some valuable additions through the kindness of one of our absent members, Mr. Jack, and the Cabinet of the Natural History Society has been materially added to by two of our members, Messrs. Winn and D. Brainerd.

Our Branch has also presented a copy of Comstock's Manual for the study of Insects to the library of that Society as a slight return for privileges accorded to our Branch.

Steps have been taken to secure as far as possible the interchange of papers between the different branches of the Society, that all may get the benefit of such papers. Should this scheme be successfully carried out, it should add materially to the interest of the meetings, and cause the several branches to take more interest in each other's work.

At the last annual meeting of the parent Society our Branch was honored by having one of its members elected to the presidency.

The Treasurer's report shows that the finances of the Branch are in a satisfactory condition.

Respectfully submitted on behalf of the Council,

HENRY H. LYMAN,
President.

The Treasurer then submitted his report, which showed an accumulated balance in hand of $38.68.

Upon the motion of Mr. J. B. Williams, seconded by Mr. L. Reford, the reports of the Council and Treasurer were received and adopted.

The President then read his annual address, giving a resume of the past year's work, and suggesting the holding of a conversazione in the autumn to mark the completion of the 25th year of the Montreal Branch.

The following officers were then elected for the ensuing year :

President—Henry H. Lyman ; *Vice President*—A. F. Winn ; *Secretary-Treasurer*—Lachlan Gibb ; *Council*—G. C. Dunlop, J. B. Williams, Dwight Brainerd.

L. Gibb, Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The second Annual Meeting of the Toronto Branch was held in the Education Department (Normal School) on Friday evening, the 1st April, 1898.

The following members were present: Messrs E. V. Rippon, President: Arthur Gibson, Secy-Treas: H. D. Chipman, C. T. Hills, C. H. Tyers, A J. Cherry, H. C. Austen, S. R. Carter, E. M. Fenwick and Frank Welch.

The minutes of the previous regular meeting were read and approved.

Report of the Council: The Secretary read the following report of the Council for the year ending 31st March, 1898.

The Council of the Toronto Branch of the Entomological Society of Ontario take pleasure in presenting the second Annual Report of the proceedings of the Branch for the year ending 31st March, 1898.

Since our previous Annual Meeting one new member, Mr. E M. Fenwick, has been added to the roll of membership, and it is earnestly hoped that throughout the year now commencing, the members will endeavor to obtain as many new additions to the roll as possible.

During the year, eighteen regular meetings have been held, and the following papers, contributed by the members, tended considerably to add to the interest manifested in, and the success attending these meetings.

"Parasitic Forms of Insects" by Mr. E. V. Rippon.

"Collecting in and about Kingsville, Ont." by Mr. C. T. Hills.

"Some of the Insect Pests of the Niagara District" by Mr. H. C. Austin.

"Muscular Powers of Insects" by Mr. H. D. Chipman.

"The Mosquito" by Mr. A. J. Cherry.

"On the Noctuidæ Occurring at Toronto" by Mr. Arthur Gibson.

On the 23rd November last the Branch had the pleasure of contributing an illustrated lecture on "Our Friends and Foes of the Insect World", through the kindness of one of our members, Mr. T. G. Priddey, to the eleventh Section of the Boys' Brigade. About 200 boys were present, most of whom took an interest in the discourse, and it is hoped that some stray seed may have fallen into good ground.

During the collecting season three field days were held, viz., on the 24th May to "Trout Creek", on the 19th June to "Trout Creek" and on the 1st July to Forks of Credit.

The Branch is indeed pleased to place on record the appreciation it feels towards the Minister of Education (Hon. G. W. Ross) and the Education Department for Ontario, for their kindness in granting the Branch the free use of a room, in which to hold meetings and store the collection and library.

The report of the Librarian-Curator shows that during the year quite a large number of valuable Government publications have been donated to the Branch, also that the collection of insects is steadily increasing.

The Treasurer's report shows the balance carried forward to be on the right side.

All of which is respectfully submitted.

E. V. Rippon, President.

The report of the Treasurer was presented, as also that of the Librarian-Curator, submitted by Mr. H. D. Chipman. On motion of Mr. Hills, seconded by Mr. Austen, the reports of the Council, Treasurer, and Librarian-Curator, were adopted as read.

The election of officers for the ensuing year resulted as follows:

President—Mr. R. J. Crew; *Vice-President*—Mr. C. T. Hills; *Secretary-Treasurer*—Mr. Arthur Gibson. (accl.); *Librarian-Curator*—Mr. H. D. Chipman; *Members of Council*—Messrs H. C. Tyers and E. M. Fenwick.

The retiring President, Mr. E. V. Rippon, then addressed the meeting. He referred chiefly to the work done during the past year, and while pleased with the result, said he would like to see the members take a more active interest in the work. As regards the collection of insects he hoped the members would contribute as many specimens as they possibly could during the coming season, and pointed out the advantage to all the members in having a representative collection in the possession of the Branch. Of course, it would not be expected that the members would neglect their own private collections, but with a little extra work on the part of each member, he felt satisfied that much progress could be made in the collection during the approaching season. He also referred to the reading of papers at the meetings, and hoped that the members would make an effort to contribute more papers in future. During the past year only six papers were contributed by the members. He encouraged those present to make more notes during the coming season, feeling sure that if such were done more papers would be contributed at the meetings. He mentioned that the outlook for the Branch's future was much brighter than ever before, as the Education Department for Ontario had very kindly granted the Branch the free use of a room in which to hold meetings, and store the collection and Library. He also touched upon the membership and hoped that those connected with the Branch would endeavor to have some new names added to the roll during the ensuing year.

The meeting then adjourned.

Arthur Gibson, Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec Branch of the Entomological Society of Ontario was held on the 26th of February, 1898. Eighteen members were present, the President, the Rev. T. W. Fyles, occupying the chair.

President's Report. The Quebec Branch of the Entomological Society of Ontario is to be congratulated on the success which has attended it during the first year of its existence. Its numbers have increased, its meetings have been regularly held and well attended, and considerable interest in natural history has been awakened in the community through its proceedings. The pleasures of its monthly meetings have been enhanced by the hospitality of its members. This has been so far extended that its gatherings have taken as much of a social as of a scientific character: though the objects of the association have never been lost sight of—"Philosophy in sport" having been made "Science in earnest."

In the course of the summer a number of rare and interesting specimens were taken, and these were afterwards exhibited and identified. Among them were some the names of which were new to the Quebec lists.

The thanks of the members are due to the authorities of Morrin College for the countenance and encouragement they have given to the association.

The Branch was represented by its President at the annual meeting of the Entomological Society of Ontario held in London, Ont., on the 12th of October. On this occasion many hearty good wishes for the prosperity of the Branch were expressed.

The parent society has reached the 35th year of its existence. Its 28th annual report is now in the press. Its monthly organ, *The Canadian Entomologist*, which has now reached its 30th volume, ranks as one of the leading Entomological publications of the day, and has an extensive circulation, not only in Canada and the United States, but in Europe and other parts of the world. Flourishing branches of the Society exist in Toronto and Montreal. The Quebec branch will, we trust, be no less prosperous than these.

The Society has experienced a great loss by the death of its Vice-President, J. Hoyes Panton, M. A., F. G S., Professor of Natural History and Geology, in the Ontario Agricultural College, Guelph. He was the author of a useful handbook entitled "Our Insect Foes and How to Destroy Them." His valuable article on "Entomology for Rural Schools," which appeared in last year's report of the Society, is, no doubt, fresh in the minds of many of you. His useful career was cut short while he was yet in his prime. The American Entomological Society has also sustained a great loss by the death of its President, Dr. George H. Horn. The *Entomological News*, of Philadelphia, thus speaks of him:

"The entomological world has lost a shining light and American Coleopterology its greatest votary. As a systematic coleopterist he probably did not have a superior in the world. His large collection of beetles was considered the finest extant in the field he cultivated. It, with his library, and five thousand dollars for the care of the former, he willed to the American Entomological Society."

Entomology in the United States has made great strides. The Division of Entomology in the Department of Agriculture, Washington, D. C., has been of vast benefit to the agriculturists and horticulturists of this continent. Its present able director, Mr. L. O. Howard, and his efficient staff, are not merely supporting, but raising more and more the high character that its services have won for it. Among the valuable bulletins that it has lately issued are:

"The Gypsy Moth in America," by L. O. Howard.

"Revision of the Tachinidæ," by D. L. Coquillet.

"Some Little-Known Insects Affecting Stored Vegetable Products," by F. H. Chittenden.

"Insects Affecting Domestic Animals," by Herbert Osborn.

The insects that are causing the greatest alarm in America at the present time are the Gypsy Moth (*Porthetria dispar*) and the San Jose Scale (*Aspidiotus perniciosus*) Comstock. Specimens of the former species escaped in 1869 from the residence of Professor Trouvelot, at Medford, near Boston; and for eight years the insects increased in numbers without exciting much attention. The species has now extended its ravages through a district of 220 square miles, and the State of Massachusetts has expended $775,000 in the effort to exterminate it.

The pernicious scale insect was first noticed in the San Jose Valley, California. It has now located itself in spots from Florida to Canada, and from Washington to New Jersey. Its wide and rapid spread is owing to the fact that it has been 'shipped' with fruit and with nursery stock in all directions, It infests deciduous fruit trees, and, unless prompt measures are taken, an orchard attacked by it will be completely destroyed in a very few years. Our Canadian Department of Agriculture has taken the alarm, and posters, drawn up by Dr. Fletcher have been widely distributed to draw the attention of fruit-growers to the danger.

But Entomology has not only to deal with insects, more or less obnoxious to man; it brings to our notice the beneficial labors of hundreds of other kinds. It holds up to our admiration the marvellous beauty with which the Creator has gifted many of his lesser creatures, and it brings home to us the teaching that "His tender mercies are over all His works." As it is in grace, so it is in nature, "He that seeketh findeth." The works of the Lord are great, *sought out* by all them that have pleasure therein.

REPORT OF THE COUNCIL In presenting this, the first annual report of the Quebec branch of the Entomological Society of Ontario, your Council finds that the branch, although not eleven months in existence, has succeded very well in the objects for which it was instituted, viz.: the inculcating and promoting a lively interest in entomology, the collection and classifying of specimens, and bringing the members together in social intercourse, through entomological excursions, lectures and gatherings at each other's houses.

Our membership is now twenty-six, viz.: eighteen adults and eight juniors. We have grounds for hope that, during the present year, it will be largelv increased.

Meetings have been held monthly, with exception of the midsummer months, in Convocation Hall of Morrin College, by kind permission of the College authorities, for which courtesy our sincere thanks are due.

Papers have been read and lectures illustrated by diagrams, delivered in the same Hall, which have been numerously attended. Instruction has also been given as to the killing, mounting and preserving of specimens, which has been much availed of; and we are glad to see it, especially amongst our Junior members. Several nicely-mounted specimens, taken during the summer campaign by members of our branch, have been shewn at our meetings and evince keen interest in the study of entomology on the part of almost all.

Papers have been read and lectures given on land beetles, two winged flies, flesh flies, mycetophylidæ (mushroom flies), bombilidæ, parasites, especially those infesting cattle, horses and sheep, and the best means of their extermination (most useful information to the farmer and grazier), as well as the tiger moths—Arctiidæ—Colias interior, etc. The caterpillars have not been forgotten and our "woolly-bear" friend, "Phragmatobia rubricosa," as he sturdily scampers over the snowdrift, lets us know that life is by no means lacking in even the smaller things of creation during a Canadian winter, for he early shows himself, a harbinger of spring.

The want of a proper cabinet for the conservation of insects arose, and through the kindness of a few of the members and friends of the Association, a very handsome one has been obtained, which is placed in Morrin College, and has already received its first instalment of insects.

Before closing what must necessarily be but a brief report, owing to the short time since the organization of the branch, we must call your attention to an item very interesting to our hive of workers, viz: the treasurer's report, which shows that, after remitting to the parent society the necessary honorarium and paying expenses, we have, out of our subscription list, a balance in hand of $6.70.

JOSEPH EVELEIGH TREFFRY,
Secretary.

The officers elected for 1898 were:

President—Rev. Thomas W. Fyles; *Vice-President*—Miss Macdonald; *Council*—Hon. Richard Turner, Mr. J. Eveleigh Treffry, Prof. H. Walters, Mrs. R. Turner, Miss Bickell, Miss B. Winfield; *Secretary-Treasurer*—Lt.-Col. Crawford Lindsay; *Curator*—Professor H. Walters.

Since the annual meeting in February the branch has held four regular meetings, and five field-days. On the latter occasions very happy excursions to the Gomin, the Island of Orleans (twice), and Beauport were made.

The branch now numbers twenty-eight adult members and fourteen junior.

CRAWFORD LINDSAY,
Secretary-Treasurer.

QUEBEC, Nov. 5th, 1898.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

Having the honor to represent the Entomological Society of Ontario, I beg leave to submit the following report of its work and proceedings during the past year.

The Society still maintains its former position as to its increasing membership. Its Branches are doing good work, and have given a very considerable impetus to the study of insect life. The Toronto Branch having been inaugurated, commenced its life with the New Year, and later a Branch was formed in Quebec, under the most favorable auspices. The Library has been augmented by an unusually large number of additional volumes, numbering no less than eighty-eight; the total number on the register now being 1,506. Important additions were also made to the Society's collections of insects.

"The Canadian Entomologist," the official organ of the Society, maintains its prestige among its class of literature. The twenty ninth volume of 306 pages was issued during the past year (1897), its contributors numbering forty-four, of whom thirty reside in the United States of America, one in Mexico, one in Germany, and the remaining twelve in Canada. These contributed seventy-six articles, in which were described twenty new genera, one new subgenus, ninety-one new species, and six new varieties.

The following are a few of the more important papers above referred to, viz.:

On the Mexican Bees of the genus Augochlora.—By T. D. A. Cockerell.

The Coleoptera of Canada.—By Prof. H. F. Wickham. Continued through nine numbers, and being also a continuation of a series of articles on the same subject which have appeared during the past three years, making an extremely useful compilation for students in Canadian Coleoptera.

A Generic Revision of the Hypogymnidae (Liparidae)—By Harrison G. Dyar.

Catalogue of the Phytophagous and Parasitic Hymenoptera of Vancouver Island—By W. Hague Harrington, F.R.C.S.

Some new species and varieties of Lepidoptera from the Western U S.—By Wm. Barnes, M.D.

Descriptions of some new Genera and species of Canadian Proctotrypidæ—By Wm. H. Ashmead.

Synonymical and descriptive notes on North American Orthoptera—By Samuel H. Scudder.

On rearing Dragon Flies—By James G. Needham.

Contribution to the knowledge of North American Syrphidae—By W. D. Hunter.

Preliminary Studies of North American Gomphinæ.—By Jas. G. Needham.

A Generic Revision of the Hypocritidae—By Harrison G. Dyar, Ph.D.

Notes on the Life History of Colias Interior (Scud)—By H. H. Lyman.

The Life History of Epirranthis Obfirmaria, Hbn.—By Rev. Thos. W. Fyles.

Notes on Grapta Interrogationis Fabr.—By H. H. Lyman and A. F. Winn.

Also there appears a number of book notices, correspondence, etc., etc.

The thirty-fifth annual meeting of the Society was held in its new room in the Young Men's Christian Association Building in London on Tuesday and Wednesday, October 12th and 13th, 1897.

The annual report published by the Society to the Department of Agriculture of the Province of Ontario consists of 104 pages, in which is contained a full report of the proceedings of the annual meeting above mentioned, together with the annual address of its President. (The reports and papers contained therein were here enumerated.

JOHN D. EVANS,
Delegate.

REPORT OF THE TREASURER FOR THE YEAR ENDING 31ST AUGUST 1898.

RECEIPTS.	
Balance on hand September 1st, 1897	$ 575 52
Members' fees	335 13
Sales of Entomologist	196 46
Sales of pins, cork, etc	74 06
Government grant	1,000 00
Advertisements	26 50
Interest	23 87
	$2,231 54

EXPENDITURE.	
Printing	$ 597 85
Report and meeting expenses	214 00
Library	35 92
Expense account, postage, etc.	133 49
Rent	175 00
Salaries	300 00
Pins, cork, etc	36 03
Balance on hand August 31st, 1898	739 25
	$2,231 54

We, the auditors of the Entomological Society of Ontario, hereby certify that we have examined the books and vouchers of the treasurer and find them well kept and correct and that the above statement is in accordance with the accounts.

W. H. HAMILTON, } Auditors.
JAS. H. BOWMAN, }

STATEMENT OF RECEIPTS AND EXPENDITURE FROM SEPTEMBER 1ST, 1898, TO 31ST DECEMBER, 1898.

RECEIPTS.	
Balance on hand September 1st, 1898	$ 739 25
Members' fees	86 90
Sales of Entomologist	15 47
Sales of pins, cork, etc	11 58
Advertisements	7 00
Interest	13 80
	$874 00

EXPENDITURE.	
Printing	$ 206 45
Report and meeting expenses	155 73
Library	22 51
Expense account, postage, etc.	22 53
Rent	100 00
Salaries	50 00
Pins, cork, etc	9 44
Balance on hand 31st December, 1898	307 34
	$874 00

J. BALKWILL, Treasurer.

THE PRESIDENT'S ANNUAL ADDRESS.

By Henry H. Lyman, M.A., Montreal.

Gentlemen,—It is with much pleasure that I welcome you to the thirty-fifth annual meeting of our society, and especially is this pleasure enhanced by the fact that our meeting is held in this city in celebration of the twenty-fifth anniversary of the formation of the Montreal branch.

It is a subject for much congratulation that our society, which started from such small beginnings, has grown to such a large number of members, with associate members all over the world, and that its monthly journal takes so high a place in the field of entomological periodicals. But I think that we in Montreal have some reason to be proud of the fact that we are the third oldest entomological association on this continent, and, without any monetary grant or assistance from Government, have been able to keep our meetings up with great regularity through a quarter of a century.

Two hundred and seventeen meetings have been held, and over 200 original papers have been read by our members, and about 80 of these have been published.

But, to turn to matters of more general interest, when an amateur entomologist, with extremely little leisure to devote to this science, has the honor, or perhaps I should say the misfortune, to be elected to the distinguished position of president of so important a society, the question what he is to do for an annual presidential address becomes at once a serious bugbear.

We amateurs have to take our science in so scrappy a fashion, in such small mouthfuls, that it is generally impossible for us to follow out any continuous line of investigation or experiment, and our work is of too fragmentary a nature to afford material for an important address. True, by reading and study, we might familiarize ourselves sufficiently with the work which has been done in some particular line by other entomologists to enable us to give a fairly accurate review of such subjects, but that seems hardly desirable, unless one can add something of interest from one's own observations.

Many of my predecessors in this office have devoted much of their addresses to a review of the principal injurious insects of the year, but I feel that this subject can be so much better handled by those who are by profession economic entomologists that I prefer to leave that task to them.

It has occurred to me that there are many subjects, some of them small in themselves, perhaps, but which for all that are not without their interest, and I have therefore determined to invite your attention to a sort of entomological omnium gatherum or olla podrida.

But before taking up any of these subjects, it is my painful duty to refer to the sad event which so early in the season, and in the maturity of his powers, deprived our society of our highly respected vice-president. Prof. Panton was elected at the last annual meeting, though unable to attend on account of illness, but I do not think that any one at that time anticipated a fatal termination, and I, certainly, looked forward with pleasure to meeting him at this annual meeting.

But the greatest loss to entomology in America, using the latter term in a wider sense than our neighbors generally use it, which has occurred during the year was unquestionably that sustained in the death of Dr. George H. Horn, who since the death of Dr. J. L. Leconte has been facile princeps among American coleopterists.

By the death of Dr. J. A. Lintner, American economic entomology has suffered a great loss, and I am sure his memory will be cherished by all who had the privilege of his acquaintance. He was a very able entomologist and a kindly, unassuming gentleman.

Among other losses by death especial mention should be made of Prof. Kellicott, of the Ohio State University, but whom I had not the privilege of knowing.

But to turn to less mournful subjects : If I were asked to state what I consider the chief characteristic of entomologists, I think I should say their patience. Surely a man deficient in this virtue would not continue long in the pursuit of this science. Are we ever thoroughly discouraged? Does not hope spring ever fresh in our hearts? We may secure the eggs of a species whose life history we are anxious to enravel, and after carrying the larvæ nearly through, and just when success seems about to reward our patient care, a mysterious disease may sweep the whole brood away, and yet we only say, "I must try it again ; better luck next time."

When I think of the myriads of species whose life histories are waiting to be unravelled, of the comparatively few who are engaged in this work, of the few life histories which we can work out in a single season, and of the very few seasons we have in which to do this work, I am inclined to think that the way we go at this task is almost sublime.

But this reflection leads me to what is perhaps a delicate question, and that is—Would it not be better if some of our friends, when working out these life histories, would give less time to debating as to more generalized and more specialized forms?

Surely it will not be contended that a more specialized form is necessarily higher than a more generalized one? There is evolution downwards as well as upwards, specialization towards degradation as well as towards advancement.

I confess that when I find able entomologists laying such great stress upon such minutiæ as one vein being slightly more appressed to another vein in one genus than in some other genus, or the presence or absence of some minute veinlet, when it is admitted that even individuals of the same species show variations in these matters, which fact has to be accounted for on the convenient doctrine of reversion, or when it is proposed to classify families as higher or lower chiefly upon the single characteristic of having or not having the fore pair of legs aborted, my share of the patience to which I have alluded tends to wear thin.

While not a champion of the New Woman, I certainly believe in the doctrine of the equality of the sexes in the case of the Lycænidæ, and protest strongly against any attempt on the part of the gentleman Lycænid to lord it over his spouse on account of his aborted fore legs. The bear has a plantigrade foot, and the domestic fowl is a biped, but it is hardly probable that these facts would lead any systematist to place these animals next to man in the order of classification. We shall never have a natural, and therefore scientific and satisfactory classification of these creatures until we know them in all their stages, when our classification will be based upon the sum of their characteristics.

There is one word which I would like to say to our professional friends, and that is, that I think they might show a little more consideration for the amateurs in the way of giving the reasons for any necessary changes of name. Amateurs have neither the time nor the opportunity to keep up in detail with the tremendous output of entomological literature, and when one takes up a number of a journal containing an instalment of a "revision" of some group, and finds that some well-known name has entirely disappeared, and after a protracted hunt finds, let me say, such an old acquaintance as *Euchætes Collaris*, Fitch, disguised under the name of Cycnia Tenera, Hübner, and this without a word of explanation of this wonderful discovery, one can hardly be blamed for exclaiming "A plague on all your revisions."

In entomology, as no doubt in other branches of natural science, some men are lumpers and others are splitters. To the latter I would say that the describing of new species should certainly not be done on the chance of their proving distinct, and to the former that once a form has been described as a new species it should not be lumped except upon overwhelmning proof. As an example of most unwarrantable lumping may be instanced the case of *Euchætes Collaris*, Fitch, which on the authority of some wise-acre was known for many years as "the common white variety of *Euchætes Egle*," because, forsooth, entomologists were too lazy or too stupid to secure the eggs and rear the species.

But I find a very curious tendency in many men to be both lumpers and splitters, lumpers in dealing with the work of others, but splitters in their own work.

A man takes up some group with the view of monographing it, gathers specimens from far and near, inspects all the types to which he can gain access, and finally announces that what have passed for half-a-dozen distinct species are merely slight local varieties of one world-pervading species.

Now this may be all right, though I think that such lumping might, perhaps, better be deferred till the forms in question had been bred through all their stages. But look what follows: among the material gathered together he finds one specimen slightly different from any of the named forms, and two other specimens which agreeing together differ slightly in some other direction, and upon these three specimens two new species are founded, although the divergence does not appear to be greater than in the case of the forms which he has just lumped; and thus we have a patent lumper and splitter combined.

What I have already said of the difficulty, especially for amateurs, of keeping up with the literature of the subject leads me to suggest that it would be a great assistance if an annual list of all the new genera and species of North American insects, with the references as to where described, were published in the January number of the "Canadian Entomologist," and I feel sure that our journal would thereby become of greatly enhanced value to all working entomologists.

The insufficient indexing of some publications is a frequent source of vexation and loss of time, and adds materially to the difficulty of those who need to refer to articles some time after their publication. If the index of every journal were begun with the issue of the first number, each article being cross indexed as soon as issued, the work would not be heavy, and when the last number was in type a thoroughly satisfactory index could be completed in a very short time. The late Dr. Lintner placed a very high value upon a thoroughly complete index, and spared no pains to make the indexes of his Reports as perfect as it was possible to make them.

From 1868 to 1873 inclusive we had an Annual Record of American Entomology, edited by Dr. Packard, with a number of leading authorities in the different orders as associate editors. It was a very useful work, and it is, I think, much to be desired that we should have some sort of an annual index of American Entomology. The difficulties in its way are, I know, very great, but if it were possible for it to be undertaken by the Division of Entomology of the Department of Agriculture at Washington, it would be a great assistance to all the working entomologists of the continent.

Another point of great importance is the care of important collections, and especially the preservation and accessibility of types. It is not reasonable for any one to expect types to be lent for study as the risk of loss or damage is too great, but they should certainly be accessible to those who visit for this purpose the museums or private collections where these types are preserved. It is certainly disappointing when one has made an expensive journey for the purpose of examining a collection, or studying certain types, to find that one's journey is wholly or partly in vain, either through the caprice of a museum curator, or through the collection being in too crowded a condition to permit of an examination being made with safety.

To any one who augments his collection by either exchange or purchase, the different styles of pinning and spreading specimens of Lepidoptera are matters of serious concern, as one generally has to reset all specimens so obtained, unless one is willing to have one's specimens at all sorts of heights, and spread in all sorts of ways. The late Mr. Morrison, who collected so extensively for his patrons, used to insert his pins so that there was frequently very little more than a quarter of an inch above the thorax, and as he used very small sized pins, which bent easily, it was very difficult to handle the specimens without knocking off the antennae.

It was a great step in advance when all the principal makers of microscopes were induced to accept the Microscopical Society's screw, as any objective could be used on any stand. Is it too much to hope for, that entomologists on this continent should adopt a standard length of pin, and a standard height at which to place the specimen on the pin, a standard spreading board for Lepidoptera and a standard style of setting? And this brings me to the most important suggestion which I desire to make, and that is, that North American entomologists might with advantage follow the example of the ornithologists and form a "Union" with a limited number of full members, and an unlimited number of associate members, the full members to be chosen from the leading entomologists of the continent, but associate membership to be open to every entomologist.

The American Ornithologists' Union has been a marked success, and I see no reason why a similar union should not work equally well among entomologists. There are many subjects with which such a union might deal, and if its decisions were generally accepted, as I have no doubt they would be, I am sure it would do a great deal to harmonize the work in this branch of science.

To mention a very few of the things which might be dealt with in addition to those which I have already mentioned I may suggest the capitalization or otherwise of specific names, the nomenclature or numbering of the veins in the wings, the designation of the various segments of larvæ, as well as all the questions in regard to nomenclature. If it be objected that ornithology is practically one subject, while entomology is a whole collection of subjects, I answer, "True, but the same principles apply to all the branches." Take the case of the capitalizing or otherwise of specific names. Some capitalize all specific names, as Mr. W. H. Edwards, with whom on this point I entirely agree, others use capitals for names derived from persons and small letters in other cases; others, and I am afraid the large majority, use the lower case letter in all cases. Would it not, however, be better in such a matter as this to waive our personal predilections and for the sake of uniformity accept an authoritative ruling by such an organization as I have suggested.

With regard to venation the question of uniform designation is of much greater importance, as it is impossible for an amateur to familiarize himself with all the systems in vogue, and hence many generic descriptions or articles on structure are quite unintelligible to many readers. The old system of named veins and veinlets or nerves and nervures seems certainly preferable to me to the confused systems of numbering now in use by different authors, and surely this is a matter which could very profitably be settled by such a body, while in the realm of general nomenclature the field is so vast that the Union would have abundant material for business at its annual meetings for many years to come.

Another point in the same connection may be mentioned, and that is in regard to the official organ of such an association. There have been at different times so many different entomological journals started and carried on for a few years only to die out again. There are many entomologists who cannot afford to subscribe to more than one journal, and it might be better if instead of so many journals with small circulations competing for subscriptions there were fewer in the field, but those more generally subscribed to.

But lest I weary you with suggestions which may be regarded as savouring of presumption in an amateur, I would now invite your attention to a rapid glance at a portion of the work which is being carried on by some of the leading entomologists of the continent. While, as I said, I prefer to leave to others who are so infinitely better qualified the task of giving a review of the insect depredations of the year, I can hardly avoid referring somewhat briefly to some of those which have attracted the widest attention.

As Canadians we are naturally especially interested in the work which our own official entomologist is engaged in. Dr. Fletcher is certainly untiring in his work, travelling about the country from the Atlantic to the Pacific to attend meetings of farmers, fruit growers and dairymen, for the purpose of interesting and instructing them in the importance of economic entomology, and in regard to the economic value of particular grasses, and the people are thus being brought to see that the aim of the experimental farms is not the providing of handsome residences in a charming locality for a certain number of scientific gentlemen, but that there is a very real money value to the agricultural interests of the country in the work and investigations which are being carried on there. But naturally from the large sums annually devoted by the Central Government at Washington and the various States to the prosecution of economic entomology by a large and highly trained force of entomologists, the work in that country must necessarily overshadow what we are doing in Canada, though I think it is also undoubtedly a fact that from our more northern latitude we are much less subject to insect depredations of a devastating character.

The attack which in recent years has caused the most widespread alarm on account of the serious nature of the damage likely to result from it is unquestionably that of the San José Scale. This most injurious insect appeared in California late in the seventies, was brought east on nursery stock to New Jersey in 1887 or 1888 and had by 1893, when its presence in the Eastern States was discovered by Dr. Howard, spread through portions of almost every one of the Eastern and Middle States causing the death of thousands of trees before its presence became known. Naturally it soon became a subject of discussion at all meetings of agriculturists and entomologists and has been the subject of legislation by sixteen of the States.

From this very necessary publicity it was naturally to be expected that other countries would take alarm and endeavor to protect their agricultural interests from so great a danger. The first country to do so was Germany, the German Emperor issuing a decree on the 5th February last prohibiting the importation of fruits and plants from America, which prohibition was subsequently restricted to living plants and fresh fruits which might be found to be affected by living scale.

Following shortly after the action of Germany came the passing by our Canadian Parliament of the San José Scale Act on the 18th March last, by which Act it was provided that nursery stock should be excluded when imported from such infected countries as might be designated by the Governor-General in Council, and the United States, Australia, Japan and the Hawaiian Islands were immediately so designated, the plants not subject to the attack of the Scale being exempted from the operation of the Act.

A month later the Government of Austria-Hungary issued a decree barring out living plants, grafts and layers, as well as the packings and coverings, but not excluding fruit except such as might upon examination be found to be infected. Following this the Government of the Netherlands sent an expert to the United States to investigate and report, and Sweden also sent an expert partly for the purpose of making a similar investigation.

The Legislature of Ontario has passed a law for the destruction of badly infested trees and providing reasonable compensation for loss so incurred, while in the United States a bill governing inter-state commerce in nursery stock and providing for quarantine in the principal ports of the country was reported favourably upon by the Committee on Agriculture at the last session of Congress and will doubtless become law at an early date.

In this connection attention may be directed to the obvious limitations of the use of natural enemies of insect pests, the attempted introduction of Californian beetles into New Jersey in the hope of their multiplying and checking the San José scale having proved a failure, as has also the attempt to infect the scales with a parasitic fungus from Florida.

The present year has been an important periodical cicada year, the broods occurring this year being the brood XVII. of the Septendecim race and brood VII. of the Tredecim race. In this connection especial attention should be called to the very important pamphlet upon this subject prepared by Mr. C. L. Marlatt, First Assistant Entomologist at Washington, and issued as Bulletin No. 14 of the new series of the U. S. Department of Agriculture. This paper extending to 148 pages copiously illustrated, is certainly the most important contribution which has yet been made to our knowledge of this wonderful and interesting insect.

Last winter, the Legislature of Massachusetts appropriated $200,000.00, the full amount asked for, to continue the work of exterminating the Gypsy Moth, and as a consequence very remarkable progress has been made in this work during the past season, and it now seems probable that if similarly liberal appropriations are continued for several years longer this important, but tedious, work will be crowned with success. The work of destroying the Brown-tail Moth has also been intrusted to the same force and is being carried on in connection with the Gypsy Moth work.

Other work in Economic Entomology which may be referred to is the progress made by the Division of Entomology at Washington in the accumulation of data concerning the distribution of injurious insects in the United States.

Mr. Pergande, in furtherance of his investigations of the Lecanium scales affecting the fruit trees, spent the summer in Europe and collected large material.

In the early spring, Dr. Howard visited Mexico to investigate the possibilities of preventing the introduction of the Morelos Orange Fruit Worm into California.

Mr. R. A. Cooley, an assistant to Prof. Fernald, has been at work upon the genus Chionaspis and has accumulated an enormous amount of material, and it is anticipated that his paper, when published, will give more than twice the number of species formerly known.

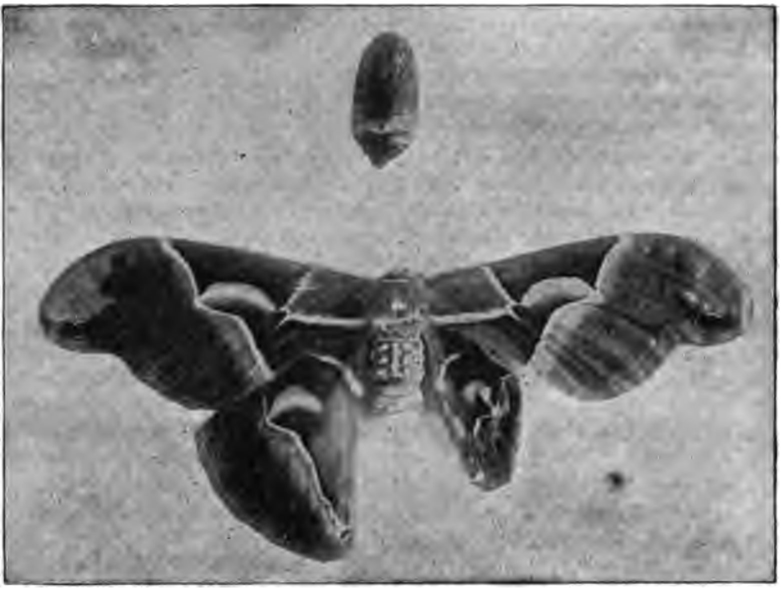


Fig. A. Operation of the first category. A compound pupa and a compound moth of P. Cynthia.

But while the economic side of the science is that which is of chief interest and importance to the community, I confess that my own interests lie rather in the direction of the purely scientific side of the subject.

From this point of view the experiments of Mr. Henry E Crampton, Jr., of the Department of Zoology of Columbia University, are of surpassing interest.

Mr. Crampton, following up the experiments of Mr. G. Born upon frog and toad embryos, determined to try similar experiments in grafting upon Lepidoptera in the pupal period and has obtained some truly marvellous results Mr. Crampton selected the pupæ of the large Saturnians, Cynthia, Cecropia, Promethea and Polyphemus as being the most suitable, though he also experimented with success upon Vanessa Antiopa, but had no success in his operations upon Danais Archippus.

The butterflies are not so well suited to these experiments as these large moths, partly because of their status being higher than that of the moths, and in the case of those which winter either in the larval or imago state, the chrysalis period is too short.

Naturally, failure resulted in a good many cases, the average of successful operations amounting to about ten per cent.

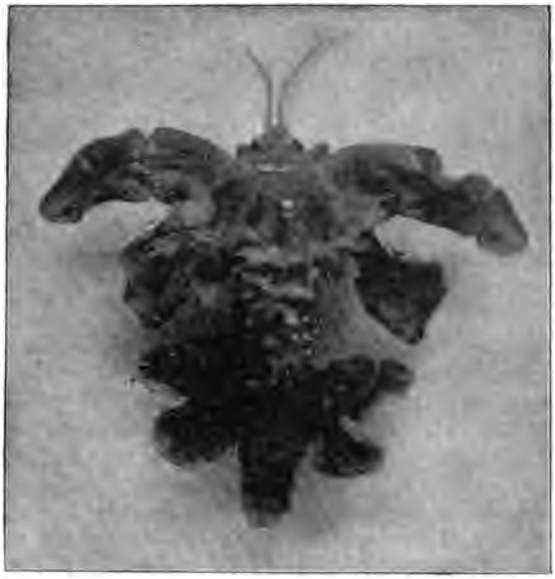


Fig. B. Operation of the second category. Union in "Tandem" of P. Cynthia, anterior, and C. Promethea' posterior.

The operations were of great variety, the anterior end of one pupa being joined to the posterior end of another either of the same or of a different species, or they were joined in tandems or in pairs back to back, while in one case the tip of the abdomen of one moth was grafted to the upper side of the abdomen of another. One pupa had had its head cut off and was still alive and the abdomens of some were cut off about the middle to see if any regeneration would take place. No cases have been successful where the division has been made longitudinally through the centre of the pupæ, and the nearer this line is approached the fewer there are which are successful, and conversely the less that is taken off the more likely are the subjects to survive.

The modus operandi is to slice the pupæ with a razor and effect the junctions with melted paraffin. The paraffin ring cannot be removed, as the coalescence is only effected between the interior portions, the two portions of the pupa case never uniting. The paraffin ring naturally tends to prevent the imagos emerging and they have to be helped out when they seem, from the papery condition of the pupa case, to be ready for emergence, the case being picked off bit by bit.

In general, the wings fail to expand and as a consequence the abdomen remains distended by the hæmolymph. In some cases the wings, or a majority of them, expand very well, one, perhaps, being aborted. In the case of a tandem junction, the anterior one may expand and the posterior one not. In such a case the former had only lost the tip of its abdomen, while the lower one had lost its head. In one case where two portions of pupæ were joined laterally, one eye in one part had coalesced with the neighbouring one in the other part to form a common eye. As a rule, the operations greatly retarded the development of the specimens.

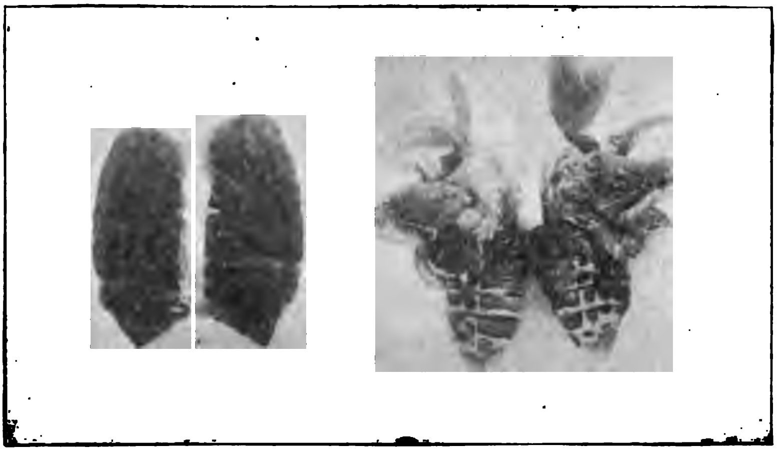
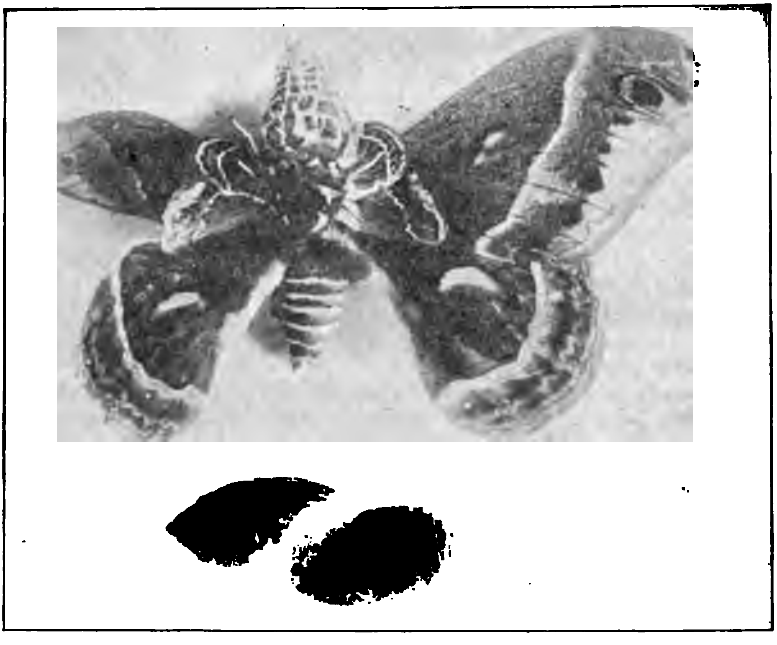


Fig. C. Operation of the third category. United pupæ and united imagines of S. Cecropia.

One of the objects of these experiments was to see what effect, if any, the unions would have on the colours of the resulting moths, but the results were rather negative, as nothing very definite was obtained.



ig. D. Operation of the third category. United pupæ and united imagines of S. Cecropia

Another object was to ascertain if it would be possible to breed from such monstros- es, but though some individuals had shown symptoms of desiring sexual connection, no ion had ever taken place, and so no eggs had been obtained, and as these operations ust greatly lower the vitality of the subjects, it seems very improbable that any tempts at breeding from these monstrosities could ever be successful*.

Another man who is doing good work, though in a much less startling field, is Dr. tto Seifert of New York, in his experiments with heat and cold applied to the pupæ of tterflies and moths. Following up the work of Dorfmeister, Weismann, Edwards, ange, Merrifield, Standfuss, and Eimer he has made extensive experiments upon a con- lerable number of species.

Pyrameis Atalanta, which seems very susceptible to these influences, Papilio sterias, P. Turnus, Colias Philodice, Grapta Interrogationis, Melitæa Phaeton, Danais rchippus, Limenitis Disippus, Vanessa Antiopa, Junonia Coenia, Arctia Arge, A. Nais, hilosamia Cynthia, and Samia Cecropia have all been experimented upon with more or ss success.

The operations were carried on by means of an incubator and an ice chest, the mperature in the former being maintained as nearly as possible at 38° C. equal to 100° . while in the latter it varied between 4° C. and 6° C. equal to 39° F. and 43° F.

In summarizing his results Dr. Seifert informs me that the effect seemed to depend ore upon the susceptibility of the individual than upon the length of the exposure to ese artificial conditions, as in some cases chrysalides kept ten days on ice produced more errant forms than resulted from others kept for thirty days on ice.

Cold and heat did not always have opposite effects in some particulars, as for instance imenitis Disippus exposed to heat was deepened in colour along the costa to the middle the wing, the mesial band of secondaries narrowing or being omitted altogether. bjected to cold the colour was turned darker also but in a different way, the darker ne being chiefly produced by many black scales along the veins, and the mesial band on condaries being more marked.

While heat in general tends to produce a more marked or defined design, when companied by an excess of moisture Dr. Seifert found a tendency to almost destroy the lour but never to affect the design.

Heat and cold were also found to affect the shape of the wings, in some cases the ex of primaries becoming more pointed, while in P. Turnus and G. Interrogationis ld caused a remarkable development of the scallops and dentations of the wings.

Cold changed the rounded secondaries of Junonia Coenia to a form more elongated wards the anal angle, while heat shapes the wings of Limenitis Disippus nearly to ose of Danais Archippus.

Pyrameis Atalanta was affected in the most interesting manner by cold, the red ansverse band on primaries above being broken up into four spots while below the condaries are much changed in appearance, the buff tone of the lower two-thirds of e outer margin being greatly strengthened and spread inwards, while a violet bloom nds to spread over the wing.

In Arctia Arge the prominent black spots on the abdomen vanish entirely or are uch diminished by heat, and the black marks on primaries are also reduced.

By cold the black spots on the abdomen are enlarged, sometimes in the female be- ming transverse bands, while on the secondaries blackish streaks originating from the se spread outwards towards the margin.

Dr. Seifert also experimented upon eggs but could only find that heat hastened de- lopment while cold retarded it. Eggs of Colias Philodice exposed to a temperature of

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*The cuts illustrative of these experiments have been copied from those in "Biological Lectures," blished by Messrs. Ginn & Co., of Boston, by the kind permission of Mr. Crampton, who delivered the th lecture at the Marine Biological Laboratory of Wood's Holl in the summer session of 1897.

100° F. hatched in 36 hours, while cold if not carried too far, 8-10 days, merely retarded the hatching, but eggs of A. Luna exposed to cold for 20 days were all killed.

The chief point which Dr. Seifert is seeking to elucidate is whether the variations obtained can be transmitted to the offspring and become hereditary. This field of investigation, while much less startling than that in which Mr. Crampton is working, certainly seems likely to prove more fruitful.

Among the most important publications on the Lepidoptera of North America which have appeared during the year must be mentioned Prof. Fernald's monograph of the Pterophoridæ, with its sixty-two pages of text and nine plates devoted altogether to structural details, which work has been accorded the highest praise by those best able to judge of its merits.

Mr. Beutenmüller has laid us under a further debt of gratitude by the issue of his "Descriptive Catalogue of the Bombycine Moths found within Fifty Miles of New York City," which appeared last month. This is on the same plan as his previous catalogues of Butterflies and Sphingidæ, and extends to ninety-six pages, with nine excellent plates. One hundred and eighty-one species are described, of which ninety-three are illustrated, but from lack of space the author had to omit all generic descriptions. At present this work is only available to those having access to the "Bulletin of the Amerian Museum of Natural History," or are so fortunate as to receive a copy of the author's edition, but I am glad to be able to announce that Mr. Beutenmüller, on completion of the series, contemplates re-issuing the whole in book form, which will then be generally available.

Mr. Beutenmüller, in addition to carrying on this important work, is also engaged upon studying various genera of the Lepidoptera with a view to revision, and has recently issued a review of the genus Euchloë or Anthocharis, to be followed later by a paper on Argynnis.

Dr. Dyar has been carrying on his important studies on structure, especially of larvæ, and is engaged in conjunction with Dr. J. B Smith upon a monograph of Acronycta, and is also at work upon a new catalogue or check list which, it is promised, will render the Lepidoptera scarcely recognizable by those who have accustomed themselves to Dr. Smith's Check List of 1891.

Dr Ottolengui of New York has taken up the Plusia group and has gathered specimens of nearly, if not quite, all the known North American forms, and has secured either specimens closely agreeing with all types which he has not been able to see or, where this was impossible, carefully executed colored figures of such types. He is thus in a position to monograph the group, and has discovered some extraordinary errors which have been current for many years. If I may be pardoned for saying so, his work has been carried on on precisely similar lines to my study of the Callimorphas some years ago, namely, by finding out first what each author meant by his description, fixing the types absolutely, and then working from that basis, instead of taking things for granted and going by guesswork, and this, I contend, is the only true method.

In Coleoptera, as I am informed, the illness and death of Dr. Horn has produced almost a standstill.

In Hymenoptera valuable contributions have been made chiefly by Mr. Ashmead, aided by Dr. Howard, Mr. Marlatt and Dr. Dyar, the latter in Tenthrenid larvæ, and the growth of knowledge in this order has been almost phenomenal, while Dr. Smith has been engaged in most interesting work on the underground forms, the Digging Bees, by means of the plaster cast method.

In Diptera the works of Messrs, Coquillett and Johnson, especially the very important "Revision of the Tachinidæ" by the former, have added much to our knowledge, and it is encouraging to note the increase in the number of students in this order.

In Orthoptera the event of chief interest has been the issue of Dr. Scudder's most important "Revision of the Melanopli," a work which must have involved an immense amount of labor and research, extending as it does to over 400 pages, and illustrated by twenty-six plates. In connection with this order attention may be called to the interesting discovery that the large Mantid, Tenodera Sinensis, Saussure, from China and Japan, has been introduced into the United States and has been breeding for at least three years in the vicinity of Philadelphia.

In regard to Hemiptera, I have already referred at some length to the San José Scale and the work in connection therewith, but mention should also be made of Prof. Cockerell's pamphlet on the other scale insects closely allied to the San José Scale and liable to be confounded with it.

The completion early last year of Mr. W. H. Edwards's magnificent work on the Butterflies of North America, which was undertaken in 1868, caused something like a pang to those who for so many years had been receiving as they appeared the successive parts of this splendid work, and the hope has been expressed on many sides that the talented author might be willing to undertake the issue of a supplementary volume of, say, twenty-five plates, for which he has ample materials, provided one hundred subscribers at $1.00 per plate could be secured.

But if the closing of Mr. Edwards's labors produced a temporary lull in the issue of beautiful illustrations of our North American butterflies, we are now about to see issued a work which is surely destined to popularize the study of the Lepidoptera on this continent if anything can.

Dr. Holland, the talented Chancellor of the Western University of Pennsylvania, who has amassed an enormous collection of Lepidoptera, including that of Mr. Edwards with all that author's types, has undertaken the publication of a large edition of a popular book on the North American butterflies, to be called "The Butterfly Book, A Popular Guide to a Knowledge of the Butterflies of North America," and has autherized me to make the following announcement in regard to it:

It will be brought out, probably about the end of November, by the Doubleday & McClure Co. of New York,* and will be illustrated by forty-eight coloured plates done by the same system of photographic reproduction and printing which has become so familiar through the publication on Birds issued monthly by the Nature Study Publishing Co. of Chicago and New York. These plates will represent 526 species of diurnal lepidoptera, in many cases giving both the upper and under sides of the insect. The figures are, in the main, taken from the type specimens contained in the Edwards collection, and many of the species are represented for the first time, having never previously been figured. In addition to the representations given of the imago, Dr. Scudder has most kindly granted permission to reproduce the plates contained in his Butterflies of New England in which the early stages of these insects are represented. There are, furthermore, to be about 200 cuts in the text, representing anatomical details of structure which are useful in the determination of genera. A cut representing the neuration of each genus is given, and in some cases additional cuts showing the subgeneric forms. Brief descriptions of the imago, egg, caterpillar and chrysalis, when the latter are known, are given in the text. Interlarded in the somewhat dry technical details are extracts from the writings of other authors, which are calculated to interest the general reader, and quotations amusing and pathetic, gathered from out of the mass of butterfly lore.

All this is to be put before the American and Canadian public in good binding for the sum of $3.00, but it will be necessary to sell 7,000 copies of the book, unless a monetary loss is to result, but surely among the 70,000,000 of the United States and the 5,000,000 of Canada there should be no difficulty in disposing of 7,000 copies of such a book at such a price.

A fair idea of the character of the plates can be obtained from the rough proofs which Dr. Holland has sent to be shown at this meeting.

A Canadian edition has been published by Mr. William Briggs, 29-33 Richmond St. West, Toronto.

Many years ago, probably about 1856 or 1857, the Cabbage Butterfly, *Pieris rapæ* (Fig. 3), was introduced about Quebec, and possibly also again about 1891, since which time it has spread westward and southward until it now extends from the Atlantic to the Pacific and nearly to the Gulf of Mexico, even its numerous parasites not being able to entirely prevent its ravages. The Codling Moth, *Carpocapsa pomonella*, was in all probability first introduced into the United States, but Canada has as you all know sustained her full share of injury from its ravages. These two species have been brought to our shores from the mother country, and they are by no means the only ones that have been introduced from Europe or Palæarctic regions, and, I fear, those that we now have with us will not be the last to come this way. The latest and most serious introduction of all, the San Jose scale, *Aspidiotus perniciosus*, is in all probability another contribution from the Palæarctic region, as I have been able to prove almost conclusively that it came to us from Japan, and we therefore received it from the west instead of the east. Recent experiences are amply sufficient to show that it will destroy the orchards of Canada as well as those of the United States, within whose domains it first made its unwelcome appearance.

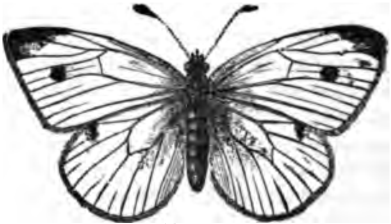

Fig. 3.

The foregoing illustrations will certainly be sufficient to convince anyone that we cannot by simple Legislative or Parliamentary enactment erect a Chinese wall, so to speak, that shall keep Canadian insects, whether native or introduced from making their way into the United States, or similar species escaping from the latter into Canada. We in the United States are more likely to import more insect pests than you, and, owing to our geographical situation, will suffer most from their depredations, but, put the matter as we will, we are much in the position of a large family threatened with an attack of some contagious disease; if one member contracts it all will be alike exposed, and to attempt prevention by individual isolation, will result in no end of trouble and aggravation without accomplishing the end desired, precisely as we have found our State laws to do. What we need, primarily, is an international quarantine measure that shall apply uniformly to all North America. A judicious, properly enforced measure that shall mean the same from the mouth of the St. Lawrence to the mouth of the Rio Grande, and from there to Vancouver or the mouth of the Yukon, and as far beyond as is found necessary. It is all very well for your Canadian law-makers to say that it is none of Canada's affair what is done in the United States, and our politicians will make the same plea, but we who are continually dealing with these problems of nature know better! We know that there is a power higher than that of our combined nations, that rules these natural elements, which power we cannot control, but, may oft'times utilise to our advantage. International entomology and international insect legislation are matters that we are being confronted with for the first time—matters of the future rather than of the past—but the next century will see them brought to the front. There will arise important questions which must be settled calmly, judiciously and justly, and entomologists must be ready to advise and counsel in these matters. The Entomological Society of Ontario ought and will have its influence in solving these international problems, as these come up one after another for solution and in accordance with nature's unyielding laws. I look for the time to come, and in the comparatively near future, when these matters will become far more important factors in international law than they are at present, as, indeed it seems impossible that the situation can be otherwise.

If we look about over the world at the present time, we find Cape Colony prohibiting the importation of all American nursery stock, whether from the United States or Canada. Several European nations have gone even farther and attempted to prohibit American green fruits from being brought within their respective domains. Queensland quarantines against New Zealand, South Australia against New South Wales, and Tasmanian fruit is condemned and destroyed in Melbourne; British Columbia destroys infested fruit from the United States as well as from other parts of British America, while

Canada prohibits the importation of nursery stock from the United States; at the same time several of these States have enacted laws which enforced to the letter would become quite prohibitory in their effects. The most of this trouble has come from the appearance of that pernicious little pest the San Jose Scale, *Aspidiotus perniciosus*, which we, in all probability, first received from the west.

Now, this method of dealing with the problem of insect control cannot be said to be all wrong, as some of it is quite necessary and proper, but there is certainly a great deal of misdirected effort being put forth and commerce is suffering therefrom to a considerable extent. It is the beginning of insect legislation, and first attempts at anything are usually more or less crude and capable of improvement. It is all right for Cape Colony to protect her growing fruit interests by keeping certain fruit pests out of South Africa, by prohibiting the importation of nursery stock, liable to infection, and keeping these Acts in force until such time as the pests have either become exterminated or some method discovered whereby the nursery stock can be effectually disinfected and rendered safe. If the Australasian Colonies had, years ago, united on a uniform code that would apply to all ports alike and admitted nursery stock and green fruits after an examination and disinfection, as has been done at the port of San Francisco, California, during the last few years, they would not now be contending against each other. If we in America had taken similar steps in the matter of insect legislation fifty years ago, we would in all probability have escaped much of the insect depredations of the present, as the major part of our seriously injurious species in this country are of foreign origin.

It is of course, too late, now, to prevent what has already been done, but it is not too late to take measures to prevent further importations from both east and west. In our efforts to suppress the insect pests that we already have with us, we are overlooking the greater problem of prevention of future similar introductions. We are laying altogether too much stress upon individual effort, as put forth by States, Colonies or Provinces against each other, and entirely losing sight of the international aspects of the problem. We cannot seem to diabuse our minds of the idea that political lines have something to do with the management of these natural organisms, and cannot apparently grasp the idea that natural barriers may be utilized by one or more nations acting in unity, and for the direct benefit of all thus acting. Sometime in the future, though neither you nor I may live to see it come to pass, these arbitrary, imaginary lines will, in problems of this sort, be lost sight of, and there will appear in their stead lines of another sort, far less imaginary and more natural, and these will encompass not one nation alone, but one or many as the case may be. We shall then designate these areas by a term now unknown, except to scientific ears, viz., Zoogeographical Regions, and while these may vary somewhat from the outlines laid down by Wallace, in his "Geographical Distribution of Animals," yet they will probably cover much the same areas as there indicated. There will probably continue to occur cases like that of the Colorado Potato Beetle, where a species may spread from one section of a Zoogeographical Region over, and become destructive in, many portions of the remainder, yet these phenomena are likely to occur but rarely. We may learn that the Almighty can make a better barrier, over or around which insects cannot make their way, than the wisest of men or the mightiest of nations. There are phenomena connected with the geographical distribution of insects for which we cannot, with our present knowledge, account. There are boundaries beyond which certain species do not make their way, though to the human eye and mind there are no obstructions in the way of their doing so. The science of applied entomology is yet in its infancy, and we have very much to learn even of our most common species of insects, but we can even now see the unnatural and impractical methods that we are trying to apply toward their control, as between one portion of the world and another. We try to erect legal barriers where none exist in nature, and ignore those which nature has provided. All of this, of course, applies to protection from future importations, and not to such as have already gained a foothold, these last being beyond the scope of my paper, as I have restricted it, and the management of these will depend largely upon the energy and care of the people inhabiting the territory over which such species are now distributed. There is, however, a very important phase of the problem of controlling these pests, this natural enemy, one of the Coccinellidæ, has been sent wherever the Orange Scale has been introduced and the effect has been the same as in this country. All of this has been an object lesson in the application of Nature's forces in overcoming the evil results of man's influences in the artificial diffusion of destructive insects. In North America and also in Australasia, men are at present wrestling with another important pest, allied to the Orange Scale, and introduced into California many years ago, but in this case probably from Japan. I refer again to the San José Scale, *Aspidiotus perniciosus*, which has, with us, spread over a vast range of country and already caused great losses. From all that I have been able to learn by observation of this pest, both in the orchards of the United States and on nursery stock immediately on its arrival from Japan, and also from the writings of others, it would appear that the natural enemies of this pest have been left in their native homes. Probably, as with the Orange Scale, these are Coccinellids whose habits are such that it would be impossible to get them in connection with their hosts at the time when the trees are packed for shipment to this country, as this is done at the season of the year when these insects have finished their development and abandoned the trees, if not wholly, remaining only in the adult state and would promptly desert the trees on being disturbed. If there had been important internal or fungous enemies we should certainly have gotten these with the host insect long ago. Now, it would certainly seem that in the introduction of Aspidiotus and its suppression we have a problem in applied international entomology, precisely like that presented by Icerya, and it would as certainly appear that, with our past experience, the very course of all others to pursue would be to learn what the natural enemies of this insect are in its native home and then introduce these as promptly and diffuse them as widely as possible, not only in one state or province, not in the United States or British America alone, but in North America.* It is Americans that are suffering from the ravages of this pest, where they are located, geographically or politically, does not matter in the least. International boundary lines cut no figure in this problem whatever, and have no more influence on these natural objects than they have on the winds. We should seek to introduce living organisms from the Palæarctic Life Region into the Nearctic Life Region, no matter what or how many nations may lay claim to the territory of either one or both of these regions. What we are really trying to do is to help natural selection to keep pace with artificial selection, and, if we accomplish anything in this direction, it will be by aiding nature and not in any sense by attempting to circumscribe her by imaginary lines of separation which have no existence in fact.

Now, lest I be misunderstood, let me say that true naturalists can only exist among loyal men and women. We must, all of us, be true to the nation that protects us by its wise and judicious legislation. Science stands for truth and right and honesty, and, for this very reason we must stop whenever and wherever these national lines cease to represent the truth, and be guided by others. In matters political, we must respect political lines, but in dealing with natural phenomena, we must abandon these and be guided by such as have been laid down by the hand of the Creator, who outranks either Queen, President or any other human potentate, Therefore, we must lose sight of national boundary lines and unite upon those laid down by nature. Here, in North America, there should be the closest relations between the United States Department of Agriculture and similar Departments of the various Provinces of British America, and absolute unity of action wherever this is possible This quarantining of one State, Province or Nation against another may possibly do in cases of isolation, like New Zealand or Cuba, or as applied to some of the ills that we already have with us, but this sort of work will never protect in the sense that a combination certainly would, if we were to throw aside

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*NOTE—Since the above was written I have received the following from the Rev. H. Loomis, of Yokohama, Japan, which will be of interest in connection with this paper. "I see in the *Canadian Entomologist*, for July, an article in which you recommend that some one be sent to Japan to make a study of the enemies of the San José Scale. I think it a most excellent suggestion. There are many varieties of Lady Beetles here, and I am quite sure that it is due to them that the Scale is not more injurious in Japan. I am strengthened in this opinion because the Gypsy Moth is found all over Japan, and yet it is not especially harmful. This is entirely due to a parasite that feeds upon the larvæ so universally as to prevent its rapid increase. I have watched the results with great interest and would recommend that both insects be made a matter of careful study."

arbitrary lines and unite on others laid down by nature. This is a phase of international entomology that will sooner or later be thrust upon us by the necessities of international commerce in articles that harbor injurious insects. We must have broader measures of protection than we have had in the past. We must take necessary precautions against the introduction of injurious species, and, after the most thorough and searching investigations, introduce the beneficial species. In all of these matters, Canada and the United States are one, and, this being true, there must be no lines of separation between the entomologists of these two countries. We must work together, shoulder to shoulder, and God speed the day when we shall do this, to even a greater degree that we are now doing! The coming century will be fraught with work for the entomologist, and his loyalty to his country will be best shown by his careful, conscientious labors.

On concluding the reading of this paper Dr. Fletcher said that he thought it was one of unusual importance and particularly so just at the present time when such great efforts were being made to prevent the spread of the San Jose Scale, a danger the magnitude of which was by no means appreciated by the fruit growers and fruit consumers of the Dominion. It was, too, eminently proper that the subject should be introduced by the writer of the pages which he had had the honour of reading to the meeting, for few people had done so much to present the subject to the public of America as Prof. Webster. It was well pointed out that the political limits of the two great countries mentioned were not recognized by the natural denizens of the faunal and floral zones which we had as naturalists to study, although by accident owing to the great lakes this was somewhat the case. International economic entomology was only in its infancy, but it was being rapidly acknowledged at its right value of importance owing to the vast interests at stake. Dr. Howard, in his letter regretting that he could not be with us to-day, had been good enough to say that he considered the relations existing between the entomologists of the Dominion and of the United States to be of an ideal nature. The speaker felt sure that all present would agree with him that this was actually the case, and further, that this happy state of affairs was largely due to the constant and unfailing courtesy of Dr. Howard himself and his assistants at Washington, too numerous to mention now by name separately, but well known to every student who required help with regard to any special family of insects; to such men as the late Drs. Riley and Lintner, to Professors Webster, J. B. Smith, Comstock, Slingerland, Hopkins, Alwood, Johnson, Cockerell, Fernald, and many, many others who were not only always ready to help, but had in the past frequently helped with most valuable papers published in our reports and in the *Canadian Entomologist*. In his official position he was brought frequently into contact with these gentlemen and found invariably the utmost kindness and ready assistance. Last spring he had by invitation taken part in a conference of economic entomologists, fruit growers and nursery men held at Washington, for the purpose of laying before Congress the advisability of passing legislation for the suppression of the San Jose Scale. A committee waited upon the Congressional Agricultural Committee and explained the wishes of the conference and a favourable report was made by the Agricultural Committee to Congress. Legislation would undoubtedly have been enacted almost identical with our federal San Jose Scale Act but for the unfortunate outbreak of the Spanish-American War—Canada however had done her part and Dr. Fletcher believed that this law was a most useful provision. The Minister of Agriculture had considered the matter most carefully and the present popular measure was due to the minister's careful enquiries and legislative skill. The Hon. John Dryden had also put forth strenuous efforts for the protection of the fruit interests of the Province of Ontario. Too much could not be said of the excellent work of Mr. W. M. Orr the Superintendent of Spraying and of Mr. G. E. Fisher who had pushed most energetically and tactfully the inspection of orchards for the San Jose Scale.

Dr. Fletcher congratulated the members of the Montreal Branch on the splendid work they were doing; he paid a well merited tribute to the persistent work which Mr. Lyman the president had been doing during many years and characterized the many papers which had appeared from his pen as being prepared with the greatest care as to detail, completeness as to research, and richness as to scientific facts they contained; his example had done much to stimulate the other members of the Branch to continue the good work they were doing for the Science of Entomology, particular attention being drawn to some of the collections exhibited at the present meeting, as those of Mr. Dwight Brainerd, who had prepared some beautiful cases illustrating the life-histories of several species of insects, of Mr. A. F. Winn, Mr. Dunlop, Mr. Williams and Mr. Norris, all of which contained many specimens of great interest. In conclusion the speaker begged to move a hearty vote of thanks to Professor Webster for his suggestive, timely and valuable paper.

This being seconded by Rev. Dr. Fyles, was carried unanimously.

NOTES ON PAPILIO BREVICAUDA, SAUNDERS.

By A. F. Winn, Montreal.

This species is either extending its habitat or has always had a wider range than credited to it, for I can now record its occurrence at Kamouraska, Que., a village on the south shore of the St. Lawrence about 85 miles below Quebec. (Lat. 47° 33′ N.)

Its locality as given in Scudder's Butterflies is "Newfoundland and the shores and islands of the Gulf of St. Lawrence both north and west," but I think Percé (Gaspe Co.) is the only recorded place on the south coast.

In July, 1889, a specimen was sent to me from Bic (Rimouski Co.) and arrived in a battered condition, but during the many seasons that I have spent my fortnight's vacation at Metis, about 30 miles further down, I have never seen the butterfly on the wing.

Rev. Dr. Fyles stated that a specimen had been taken last summer on the Island of Orleans, P. Q., by Mrs. Turner, of the Quebec Branch.

In 1896 I had not made up my mind where to spend my holidays and wrote Mr. L. Reford at Metis, asking him whether he was finding any good specimens and whether there was any hotel accommodation. He replied that he had taken a number of good things, among others a Papilio larva, and that there were plenty more to be found on a beach plant resembling celery.

I left for Metis on August 16th and found on my arrival that most of the larvae were nearly full grown, but a few were in their third stage. Some that Mr. Reford had in his house were just entering the chrysalis stage. We boxed all the mature larvae we could find and left the younger ones to feed on the archangelica plants during our stay, and before starting home gathered all we could find along with a supply of growing plants in tomato tins. The plants stood the journey well and grew nicely in the garden and we had no difficulty in getting all the larvae into chrysalis, but neither of us was successful in breeding a butterfly. All of my chrysalids were attacked by the parasite, which destroys so many P. asterias chrysalids—*Trogus exesorius*.

Thinking the species might be different I sent a specimen to Mr. Harrington of Ottawa, who has kindly determined it as the dark form of T. exesorius.

From larvae obtained the following year (1897) Mr. Reford managed to get one fine imago, which hatched in midwinter.

During the past summer I spent my vacation at Kamouraska, arriving there on August 13th and remaining until the 28th, spending part of 13th with Dr. Fyles at Levis. On the morning of the 14th while walking along the beach I noticed some rocks of the same slate formation that we had found the food plant of *brevicauda* among at Metis and after a few moments was pleased to find two or three plants but could find no larvae. A few yards further on, however, there were a number of plants and on them several larvae in their second stage, some in the first and some eggs.

The eggs are pale yellow, smooth and spherical except that the base is considerably flattened, and are attached mostly to the upper surface of the leaves, but sometimes to the lower side and on the stem and a few were on surrounding objects including a stick which lay across the rocks and on the rock itself.

Before hatching the egg becomes slate color. The larva has already been described and is so like P. asterias in all its stages that I could observe no points by which the two species could be distinguished.

I sent some larvae to Dr. Fyles at Levis and some eggs to Mr. Brainerd of Montreal, keeping a few eggs myself, and of these the first hatched August 15th and the first chrysalis was formed August 31st, making a larval period of 16 days—a remarkably short one, as Scudder observes, for such a high latitude. A number of larvae and eggs were found during the whole of my stay and when I examined the plants for the last time on the 28th the full grown larvae were crawling over newly laid eggs, and larvae of all sizes were side by side.

The first butterfly I saw was on the afternoon of the 14th, a little way back from the shore, but I afterwards found that the foodplant grew in a ditch in the same field. I failed to capture this female, and saw no more until the following Sunday (21st) when a party of us went to Tache's Point, a rocky promentary covered with trees, about a quarter of a mile north of the church. Several broken males were caught, but not having my net I could not catch the few that were in good condition. After lunch I returned with my net and caught one male in fair condition, and a number that were otherwise. On the 22nd I took a run on my bicycle along the main road towards Riviere du Loup, and got off at the bridge crossing the St. Paschel river, and followed the dyke, which the farmers have built to keep the sea out of their fields, and along the dyke the Archangelica grows in profusion. Eggs and larvæ were plentiful, but in no case more than four larvæ on one plant. I put my net together and waited for butterflies, but a strong wind was blowing which almost made me give up for the day, when a female fluttered through the fields, stopping to lay an egg here and there. I saw that the specimen was a damaged one, and thought that it would be best to watch it for a while, so got into a ditch where the food plant was most abundant, and the butterfly soon settled close to me and laid an egg on the top of a leaf, then went underneath and laid another, and finally crawled down the stem, or rather backed down, laying a third egg at the juncture of the three footstalks of the leaves. As it was flying off I caught it and boxed the eggs. Two of these hatched August 31st, the third did not hatch, although the larva was fully formed within. The egg stage is thus about nine days, and from laying of eggs to chrysalis is less than a month under favorable circumstances.

Regarding the feeding habits of larvæ, Scudder says (authority Mead) that "they are very susceptible to cold, prolonged darkness, or confinement of any kind, and when not feeding they either rest on the leaves in full sunlight or bask on the hot stones." My experience at Metis and Kamouraska does not corroborate these statements, for not having any proper breeding cages with me I kept my larvæ in the absolutely light-proof boxes used for photographic plates, and though I had at times as many as sixty in a box, I never had a healthier lot of larvæ. The young larvæ when at rest certainly lie on the top of the leaves in the sunshine, though you will rarely find a full-grown one in this position, but search the stem and the old ones are easily seen, and smelt too. Several times I visited the plants before breakfast, about 6.30 a.m., and found that all were at work and none at all on the stems, and on August 26th some were seen feeding at 8.30 p.m., though moonlight is not good for observation of this kind.

In the chrysalis there are two distinct forms, the green and yellow, and the light and dark brown, and I find that all my larvæ which suspended themselves on stems of the plant have produced green pupae, while those that crawled into boxes and shelters that I provided for them have assumed the brown form.

The species is regarded as single brooded, quoting Scudder again, "flying in June and the first half of July, and is most abundant the latter half of June. Eggs have been obtained from June 14th for a month, some chrysalids carried south gave out the butterfly the same year, one in eighteen days."

If in the northern part of its range the butterflies fly through June and begin to lay eggs before the middle of the month, it seems probable that it should occur in a warmer region, such as Kamouraska, even earlier, and there would be ample time for a second brood before the middle of August, but to settle this point it would be necessary to see the butterflies on the wing and eggs laid in June, and chrysalids in July, and some member of our newly formed Quebec branch could easily solve the matter. Finding the species in so many stages at the same time seems to me to favor the idea that there are two broods, as in my experience in species that are single brooded the imagos appear for a short period with great regularity, and in the early stages the moulting and pupating of all are within a comparatively short time of one another, but in two brooded species the first brood is regular and the second not, while in many brooded species, such as *Pieris rapae* and *Grapta interrogationis*, the last broods seem hopelessly mixed up.

The last femalethat I saw on the wing at Kamouraska seemed to be a perfect specimen and if single brooded must have spent at least eleven months in the chrysalis, which Gosse states (Can. Ent. XV, 45) is the period of this species in Newfoundland.

Dr. Fyles, in commenting on the paper, said that he had received some of the larvæ from Mr. Winn, with a supply of food-plant; when this was exhausted he endeavored to find a substitute, but the larvæ were very hard to please. Eventually he succeeded in getting them to eat the leaves of parsnip, though they would not touch carrot, on which the larva of *P. asterias* feeds. He found that the chrysalids formed on the stem of the plant were like it green in color, while those which transformed in the box were brown. (Specimens of both were exhibited). He had five chrysalids in good condition, from which he hoped to obtain the butterflies,

Dr. William Saunders, the original describer of the species, upon being called upon said his specimens were sent to him from Newfoundland by a collector there, and he had never met with it personally. He was very much interested in the careful work detailed by Mr. Winn; just such work should be done in every species, studying it in every stage until its life history was completely known. The society has shewn by its publication of so many original papers in the *Canadian Entomologist* that it fully appreciates this line of work, and he believed that in no other publication had so many and such valuable papers appeared as in our own magazine.

The meeting then adjourned, it being six o'clock p.m.

THE CONVERSAZIONE.

On the evening of the 8th November a very enjoyable Conversazione was held at the Natural History Society's Museum.

This was got up by the Montreal Branch in celebration of the 25th anniversary of its formation, and with the kind assistance of the Natural History Society and Microscopical Society of Montreal and the Parent Entomological Society, which all gave grants towards the expenses as well as other assistance.

Unfortunately there were other powerful attractions as Lord and Lady Aberdeen were making their farewell visit to Montreal and it was also the opening week of the much advertised new theatre, Her Majesty's, but in spite of these other attractions about two hundred guests accepted the invitation. The guests were received by Mr. Henry H. Lyman, President of the Entomological Society, and Mrs. Clarence Lyman, Dr. F. J. Adams, President of the Natural History Society, and Mrs. Adams, Mr. Albert Holden, President of the Microscopical Society, and Mrs. Holden. Among those present were noticed Mr. Samuel Finley, a Governor of McGill University, and Mrs. Finley, Dr.

and Mrs. Wm. Saunders of Ottawa, Mr. and Mrs. Fysshe, Mr. and Mrs. Beaudry, Dr. Girdwood, F.R.S.C., Prof. of Chemistry in McGill University, and Mrs. Girdwood, Rev. Dr and Mrs. Campbell, Mr. J. H. Joseph, Prof. MacBride, Prof. of Zoology in McGill University, Mrs Cox, Mr. Sumner, Mr. J. D Evans, C.E. of Trenton, Mr. and Mrs. G. C. Dunlop, Prof. and Mrs. Donald, Mr. F. S. Lyman, Q.C. and Miss Lyman and Miss Cassels, of Washington, Mr. and Miss Scott, the Messrs. and Miss Brainerd, the Misses Dunlop, Dr. Shirres, Dr. Deeks, Mr. Winn, Mr. Clarence Lyman, Mr. Walter Lyman, Mr. and Mrs. Plimsoll, the Misses Redpath, Mr. and Mrs Lighthall, Mr. De Sola, Mr. and Miss Cramp, Mr. and Mrs. Gibb, Mr. C. T. Williams, Mr. Stevenson Brown, Mr. J. B. Williams, F.Z.S., Mr. Dearness and Mr. W. E. Saunders, of London, Mr. Gibson, of Toronto and many others.

Shortly after 9 o'clock the three presidents proceeded to the platform, which was decorated with palms and chrysanthemums, along with Rev. Dr. Bethune of Port Hope, Dr. Fletcher of Ottawa, and Rev. Dr. Fyles of Quebec. Mr. Lyman called the gathering to order, the guests seating themselves to listen to the addresses, and in a brief address welcomed the guests to this celebration and traced rapidly the history of the Branch from its formation on the 16th October, 1873, pointing out that so far as he could ascertain it was the third senior existing entomological society in North America, being only antedated by the American Entomological Society of Philadelphia and the parent society at London, Ont., and stating that 217 meetings of the branch had been held, at which over 200 original papers had been read, of which some 80 had been published.

Mr. Lyman briefly referred to the vast economic importance of the study and as an illustration mentioned that during the current year the State and Federal authorities of the United States were devoting no less a sum in the aggregate than about $350,000.00 to the prosecution of economic entomology.

Mr. Lyman expressed his regret that he had been unable to secure the attendance of any entomologists from the neighbouring Republic although pressing invitations had been sent to Dr. Howard, Dr. Holland, Prof. Webster, Mr. Slingerland and Mrs. Slosson.

After announcing that Dr. Bethune, Dr. Fletcher and Dr. Fyles would also deliver addresses, Mr. Lyman resigned the chair in favour of Dr. Adams.

The Rev. Dr. Bethune, Port Hope, one of the founders of the original society, and second President, spoke briefly of the work done by the parent society, and of the rise and progress of entomology in Canada.

Dr. Fletcher, the Dominion Official Entomologist, Ottawa, touched upon the economic aspect of the subject, and the value of a knowledge of entomology.

The Rev. Dr. Fyles, President of the recently formed Quebec branch, spoke briefly of the work done in that city. He also presented greetings from his branch to the Montreal branch.

On the conclusion of the addresses the majority of the guests repaired to the museum up stairs, though some lingered in the reception hall to examine the many beautiful objects, chiefly of an entomological character, which were exhibited under a large number of powerful microscopes by members of the Microscopical Society. The stairway and entrance to the museum had been tastefully decorated with flags, butterfly nets and other entomological paraphernalia, two long handled nets for working electric arc lights being especially noticeable.

The orchestra under the direction of Mr. Charles Reichling, which had been playing during the reception of the guests, took up a position in the gallery and discoursed sweet music during the remainder of the evening.

In the museum hall a fine exhibit of insects, chiefly Lepidoptera, was displayed the show cases being further embellished with potted plants.

The exhibits were chiefly furnished by the members of the Montreal branch, Mr. Lyman, the President and Mr. Winn, the Vice-President, each showing 30 cases exemplifying all the families of North American Lepidoptera except the micros. Mr.

Brainerd showed six cases beautifully illustrating the life histories of a number of interesting species, while Mr. Dunlop contributed an equal number of cases of striking exotic species. Mr. Norris showed about half a dozen drawers illustrating Montreal species as well as the method of preparing and spreading lepidoptera, while Mr. J. B. Williams exhibited an interesting case showing the life history of the Walking Stick (Diapheromera Femorata). In addition to these exhibits by members of the branch, the Museum Committee of McGill University contributed six large cases of strikingly beautiful tropical butterflies mounted on the Denton tablets, while the Natural History Society showed its collection of Canadian Coleoptera and a few drawers of exotic Lepidoptera.

Refreshments were served about half past ten o'clock and a very enjoyable evening was brought to a close shortly after 11 p.m.

ELECTION OF OFFICERS.

After a meeting of the Council had been held for the transaction of business, the general session of the Society was resumed at 11 o'clock a. m., Dr. Bethune occupying the chair at the request of the President. The first proceeding was the election of officers for the ensuing year, which resulted as tollows: See page 2.

THE FARMERS' GARDEN AND ITS INSECT FOES.

REV. THOMAS W. FYLES, D.C.L., F.L.S., SOUTH QUEBEC.

Once upon a time some new tenants came to a farm-house in the neighborhood in which I was residing. A former owner of the place had enclosed a piece of ground on one side of the house and had formed a lawn and flower-beds, and planted fruit bushes and ornamental shrubs. The place was a quarter of a mile from my home; and one day I walked down to see the new-comers. I found them busily engaged in driving half-a dozen hogs into the enclosure I have mentioned. I ventured to suggest that the animals would play sad work with the flowers. This was the reply—"from a heart as rough as Esau's hand,"—"Flowers, flowers! The only flowers we care about are cauliflowers!" The answer expressed the prevailing contempt, in that comparatively new settlement, for everything like home adornment. I ought not to say *everything*, for an exception must be made in favor of bed-quilts. The females of that neighborhood spent much of their spare time in the manufacture of bed quilts. The choicest kinds were white, and had Turkey-red flowers and fruits, and intensely green leaves of impossible shapes trailing all over them. The possessor of a dozen varieties of such "spreads" was a proud woman. She would occasionally hang her art-treasures in the open space in front of her house, to excite the envy and admiration of her female neighbors, who would occasionally light their pipes and stroll round to examine the patterns.

The typical farm-house, at that time, and in that part of the country, was a story-and-a-half, oblong building, covered with rough, unpainted, hemlock boards. The main door was at one end and opened into the living-room. It and a trap-door into the cellar were, in some instances, sheltered by a rude veranda. In the door, near the bottom, was usually found a circular hole with a lengthened slit above it, in which a light shutter fitted to the opening, was suspended on a wire to allow egress and ingress to the cat. A story was told of a man who had two such openings made—a larger and a smaller—for the convenience of the cat and the kitten.

This primitive dwelling usually stood on a knoll in a yard open to the road. The yard, which was the receptacle for the refuse of the house thrown from windows and doors, was encumbered with logs drawn up for fuel, and was littered with chips. It was the common play-ground—if I may be allowed so to *generalize*—of the poultry, pigs and pickaninnies; and in it, in the summertime, one or two "smudges" were kept burning to drive away the mosquitos and black-flies.

The vegetables used by the people of that locality at that time were chiefly of field growth,—potatoes, Swedish turnips and pumpkins. The fruits were apples, from seedling and ungrafted trees, and the wild berries of the country,—strawberries from the meadows, raspberries from the pastures and roadsides, and "high-bush" cranberries from the swamps. The raspberries were spread on sheets of hemlock-bark, and dried in the sun for winter use; the strawberries and cranberries were preserved with maple-sugar. I remember my only experience of cranberry jam. It was at a party to which I was invited. I found myself incommoded by the large, flat, crustaceous seeds with which the preserve abounded. I stole a glance around to see how my neighbors disposed of these seeds and I found that the orthodox plan was to swallow them whole. I tried this for the occasion, but from that day forth I carefully avoided "cranberry sass"—as it was called in the vernacular.

Happily the race I have spoken of have passed away. Many of them were seized with the "Western fever," and moved to North Dakota and other distant places, to retard civilization in them. Their rude dwellings also are gone, or have been altered out of recognition. The succeeding generation is more enlightened and refined. The change has been largely brought about by the agricultural association and county fairs, which, through their prizes given for the best-cultivated farms, the best gardens, the finest vegetables, fruits, and flowers, and the choicest productions in the arts of life, have done a vast amount of good. Improved schools, superintended by well-trained teachers, have fitted the rising generation to appreciate the agricultural and horticultural literature that has been widely circulated—reports and bulletins from our Experimental Farms and Scientific Associations; papers and magazines on rural affairs; and last, and I venture to say not least, illustrated catalogues from our seedmen and florists. These last have done much to create and foster a taste for horticulture. Now moreover improved machinery and garden implements enable the farmer to carry on his gardening operations with ease and expedition; so that good results around the homestead may be obtained without detriment to the operations on the farm at large.

My ideal of a farmer's homestead is this: a house facing the road, but a little back from it, having convenient verandahs—that to the front being furnished with wide-meshed wire netting extending from its base to its roof, for the support of such climbing plants as the English honeysuckle and Jackman's clematis. The Virginia creeper, which is a favorite on account of its free growth, is apt to hold moisture and rot the wood-work. If grown at all it should be often trimmed.

Behind the main building should be an extension connected with the dairy, woodshed, etc., and facing this a yard, approached by a sideroad, and bounded by a shed for vehicles. Beyond this shed should be the cattle-yards with shelter for the animals, and then the barns.

In the lee of the buildings, though not in their shadow, I would have the ground for small fruits, and beyond it the orchard. The bushes should be planted in rows, and far enough apart to allow a steady horse with a cultivator to pass between them. Nothing is gained by crowding plants. The use of the cultivator and hoe should keep the ground around and under the bushes clean.

The kitchen-garden proper should be unincumbered with bushes and permanent paths, so that the manure carts may be driven anywhere over it, and the ground thoroughly ploughed in the fall, and again in the spring. I would have no partitions of beds except such as might be made with the hoe or shovel as occasion required.

The drive to the front of the house should come with a sweep round the central bed, and be flanked with flower-borders. Beyond these would be the lawn, with ornamental shrubs planted singly or in clumps: syringas, Tartarian honeysuckle, viburnum plicatum, the purple-leaved berberry, and lilacs white and purple.

In the front bed the house-plants moved from the windows when the green blinds were replaced would find suitable summer quarters, and a vase in the centre of it containing trailing and other plants would add to its beauty.

For the flanking beds, plants that require little attention and make a good show are desirable. To my mind the old favourites are the best—low shrubs like the Mahonia, moss-rose, and flowering currant; St. Joseph lilies; perennials such as iris, Chinese pœony, dicentra, perennial phlox and bee-larkspur; biennials as the Sweet William, Canterbury bell, foxglove and hollyhock—the last named, judiciously placed, produces a fine effect. Such plants require but little time for their cultivation. The forking in of a dressing of manure, an occasional shifting of place and dividing of them to prevent overgrowth, are the main operations required.

Around the whole should be a sheltering belt of evergreens—young pines, hemlocks, and Norway spruce. A few inexpensive rustic seats placed here and there under the trees would give an air of repose to the scene.

Supposing the buildings, yards, gardens and orchard to occupy five acres out of a hundred acre farm, the space will be well and profitably taken up.

Now what insect foes would the owner of such a property have to contend with The insect spoilers are numerous. For convenience we may group them into—

(I.) Those that suck.
(II.) Those that bite.

Each group may be sub-divided into—

(1) Open workers.
(2) Hidden workers.

And the methods to be taken against them may be spoken of as:

(*a*) Preventive.
(*b*) Destructive.

Of insects that suck the different kinds of plant-lice and scale-insects are most to be dreaded. They belong to the families Aphidæ, Coccidæ and Coccinæ in the order Hemiptera.

Some species of them are familiar to many persons. Their fondness for house plants has brought them into notice; and the difficulties experienced in exterminating them have created a desire for further information as to their nature and habits.

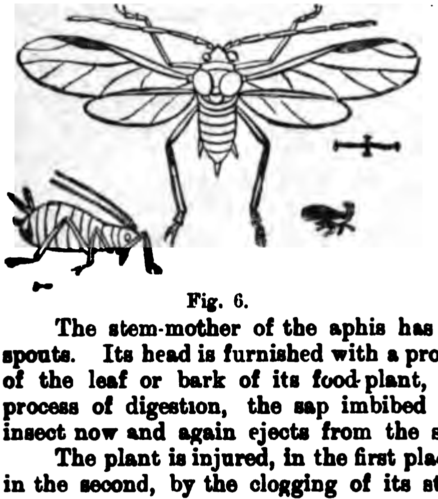


Fig. 6.

The perfect male and female aphides appear late in the year (Fig 6). The female deposits egg-like capsules upon the stems and branches of the food plant of her kind. Each capsule contains a perfect louse, which, in early Spring, bursts from its envelope and becomes a stem-mother capable of producing 90 or 100 creatures after her own likeness, and as prolific as herself. Seven or eight generations of such agamic producers succeed each other—their numbers increasing by geometrical progression till they count up to billions.

The stem-mother of the aphis has a flask-like body from which project two small spouts. Its head is furnished with a proboscis, which the insect drives into the substance of the leaf or bark of its food-plant, for the purpose of imbibing the sap. In the process of digestion, the sap imbibed is converted into the "honey dew" which the insect now and again ejects from the spouts above metioned.

The plant is injured, in the first place by the withdrawal of nourishment from it, and in the second, by the clogging of its stomata, or breathing-pores by the accumulation of the viscid honey-dew.

Now it is evident that the aphides cannot be assailed through their mouths by poisonous spraying, as the leaf-eating insects can. They cannot be poisoned, but they can be suffocated. Whatever effectually closes their spiracles brings death to them. Spraying with kerosine emulsion, applications of whale-oil, size, pyrethrum, tobacco smoke, are all effective.

To witness the deadly effects of oil upon an insect, apply with a feather or camel's-hair brush a drop of linseed oil to the body of a troublesome hornet or bumble-bee buzzing in the window. The end comes quickly! The oil is not taken into the stomach of the insect, but is spread over its body, and clegs its breathing-pores, and the insect dies.

The aphides left to run their course, at length give rise to a generation of winged insects; and these proceed to make the preliminary arrangements for the next year's round of aphidean gatherings and festivities.

The aphides are named according to the plants they frequent. Thus we have:—

The aphis of the apple, *A. mali*, Fabricius.
" " plum leaves, *A. prunifolii*, Fitch.
" " currant, *A. ribis*, Linnæus.
" " cherry, *Myzus cerasi*, Fabricius.
" " cabbage, *A. brassicæ*, Linnæus, etc, etc.

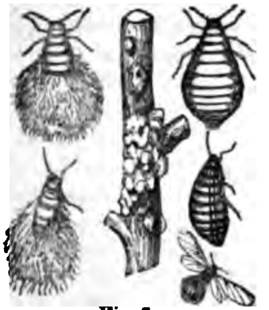


Fig. 7.

An easy way of smoking a house-plant is to turn an empty flour barrel over it, at the same time inserting a suitable vessel containing two or three pinches of tobacco and a small live coal. The smoke will soon do its work.

For the destruction of that troublesome insect the woolly aphis or "American Blight" (*Schizoneura lanigera*, Hausmann) (Fig. 7) which is found in white patches on the apple trees, the use of a scrubbing brush with diluted soft soap is recommended. By this means the insects are crushed and the tree cleansed at the same time. The house plants may be freed from that trouble-pest, the common mealy-bug (*Dactylopius adonidum*, Linnæus) by more gentle treatment of like nature.

The aphides have many natural foes. Among them are various kinds of lady-birds, the lace-winged flies and syrphus flies, all of which are predaceous upon them—destroying them from without; and an aphidius which is parasitic, destroying them from within.

Insects even more difficult to deal with than the aphides are the scale insects. The scrubbing-brush and soft soap may be used for their discomfiture. All the insects that we have yet considered work in the open air. There are others that live by suction, but operate under ground. The most formidable of these is the Dog-day Harvest Bug, *Cicada canicularis*, Harris.

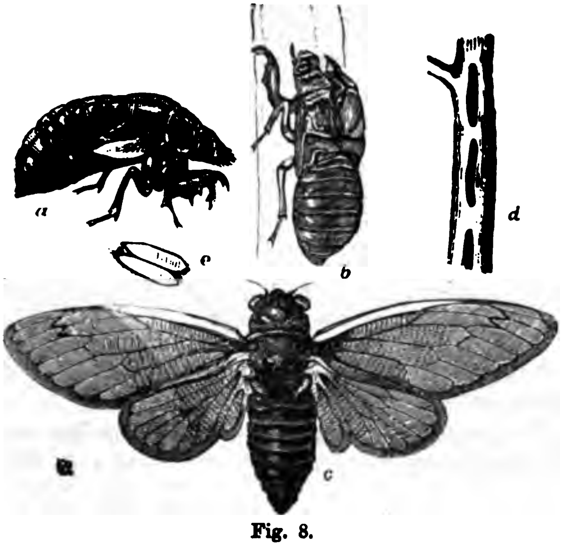


Fig. 8.

I made acquaintance with this insect many years ago, in Montreal. I was walking up Mountain Street, and, when near the top of it I saw a very seedy looking individual of the bug tribe creep from the soil at the foot of a large elm-tree (Fig. 8a) and begin to climb the trunk. I sat down and watched it. After ascending about two feet it dug its claws (It was very well provided with claws!) into the irregularities of the bark and took a firm hold. It then commenced to writhe and twist as if it were taken with a violent internal disorder. Surely something will come of all this commotion I said to myself; and something did result—its skin was suddenly rent from the head to the abdomen (Fig. 8b), and the creature began coolly to crawl out of its own skin, drawing out its legs as if it were taking off its boots. When quite free it shook out its wings, and in a few moments presented the appearance of a perfect cicada. (Fig. 8c.)

The female cicada is furnished with a remarkable organ, one part of which resembles a double key-hole saw. With this she cuts into the bark of the tree and forms a receptacle for her eggs. These eggs she carefully deposits. After a while they hatch, and the larvæ which come from them find their way to the roots of the tree, into which they thrust their beaks. Then commences the work of suction that lasts for a length of time—the juices of the tree being the only nourishment the creatures receive. One species of cicada (*C. septemdecim* Linneus) spends 17 years at this employment.

It is in orchards of some standing that the cicadas are most likely to establish themselves; and it may be that the operations of these hidden foes have more to do with the occasional shortage of fruit than people have an idea of. How to reach the spoilers is a problem. Probably one of the best suggestions that has been made is, to enclose the orchard with a sufficient fence, and then, to do as the people above-mentioned did with the garden—turn the hogs into it. The animals will grub (*grub* is a very appropriate word!) about the roots, and destroy a variety of larvæ and pupæ. They will loosen the sod and let in the air; and their droppings will help to fertilize the soil. The use of the bush-harrow and the rake, and the scattering of a little grass seed after the animals have been removed will repair the damage they may have done.

Against the biting insects the campaign should begin after the leaves have fallen. The fruit-trees should then be carefully examined for the eggs of some kinds and the cocoons of others. The beadlike eggs of the Brown Vapourer (*Orgyia antiqua*, Linnæus,) attached to the vacated cocoons of the mother insects, and the egg-patches of the Gray Vapourer (*O. leucostigma*, A. & S.), covered with a protective that resembles sugar frosting, will be found readily enough where the creatures are plentiful. The brown elongated masses of the eggs of the Lackey Moths (*Clisiocampa Americana*, Harris, and *C. disstria*, Hubner,) should be looked for on the twigs (Fig. 9), and when found cut away and destroyed, as should also the cocoons of the Saturnians.

As soon as the buds appear in the spring, Paris green and water well stirred should be applied to the fruit trees by means of a force pump and spraying nozzle. This spraying will destroy the injurious "bud-worms," "leaf crumplers," "canker worms," etc., and later applications will overcome those troublesome pests the "tent-caterpillars" and "fall web-worms," and other less conspicuous foes.

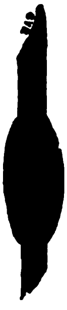


Fig. 9.

White hellebore, applied with a dredger, or mixed with water and sprinkled with a can over the fruit-bushes will kill the larvæ of the "currant saw-fly" (*Nematus ventricosus* Klug) Fig 10, and those of the span-worm (*Enfitchia ribearia* Fitch) Fig 11. A like application to the rose bushes will free those plants from "slug-worm" (*Selandria rosæ* Harris), and from the leaf-crumpling caterpillars of the pretty little brown and white Tortrix *Penthina nimbatana* Clemens).

With one notable exception our butterflies can hardly be said to be injurious. The larvæ of most of them feed on weeds or plants of little value. A few of them feed on cultivated plants.

Papilio turnus Linnæus, feeds on the apple, etc.

P. asterias Fabricius, feeds on the parsnip, carrot, etc.

Pieris oleracea Bd. feeds on the potherbs.
Grapta interrogationis Fab. feeds on the hops, etc.
G. progne Cramer, and *G. gracilis* G. and R. feed on the currant.
Thecla strigosa Harris, feeds on the plum.

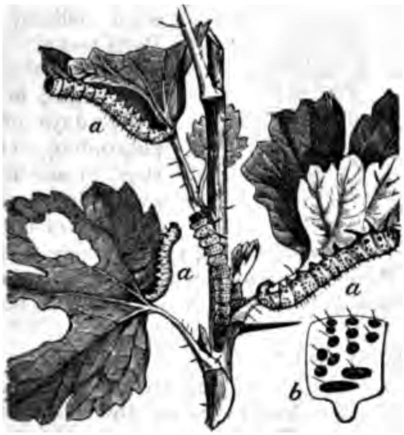


Fig 10.

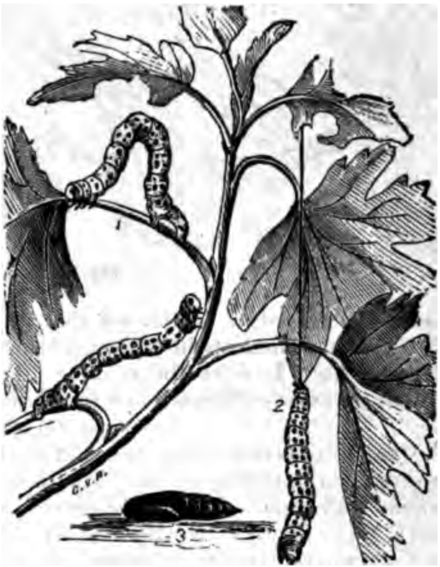


Fig 11.

But these insects are few in number, and so widely scattered, that they do little, if any, harm.

The one exception is *Pieris rapæ* Linnæus, the "cabbage-butterfly" (Fig 2). This is an exceedingly troublesome insect. The best method to check its ravages that I know is to set an intelligent child to work to pick off the caterpillars (Fig 12 *a*) from the plants, and to crush them under foot. The chrysalids (Fig 12 *b*) of this species, and of others, may often be found attached to fences and buildings.

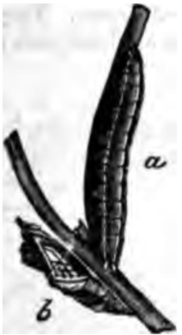


Fig 12.

I lately had the opportunity of witnessing the proceedings of a Papilio brevicauda larva when about to change to a chrysalis. It spun, on the side of a twig, a little pad, to which it attached itself, having climbed into a proper position for doing so. When it had settled itself, it turned its head to its back and ejected, through its mouth, a drop of mucous which it drew out in a silken thread, and attached to the twig. It then turned its head round on the other side, and deposited another drop on the same spot, drawing it out and fastening it as before, thus making a complete loop. The ends of this it strengthened with a branching web. Having completed its arrangements it curved its shoulders, drew in its head, and remained quiescent for two or three days—that is, till its loop and other fastenings were firm and dry. Then its skin was rent at the thorax, and, by a succession of heaving and swaying motions, was worked back, segment by segment, till it reached the extremity or cremaster, from which, in a little while, it fell away, leaving a delicate green chrysalis with a row of yellow knobs on either side, and with pretty salmon-coloured spiracles.

The farmer no longer dreads the Colorado potato-beetle, *Doryphora decem-lineata* Say (Fig 13). He knows how to deal with it; and its numbers are diminishing, thanks to the information spread through the country by entomologists, on the use and efficacy of Paris green.

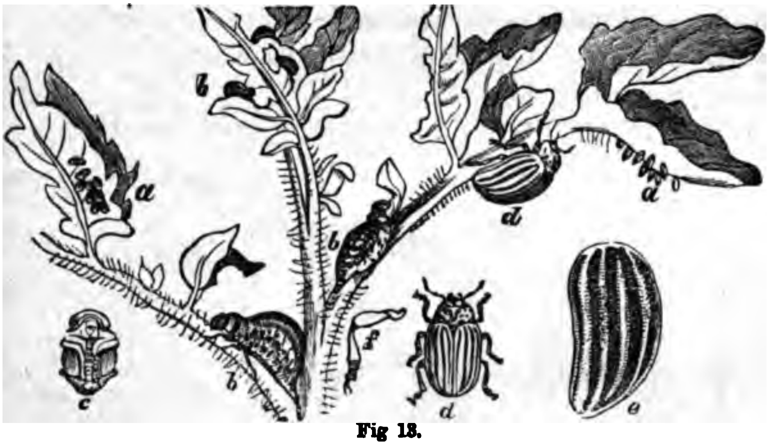


Fig 13.

It was a remarkable sight, in the early days of the potato-bug visitation, to see all the available members of a farmer's household busily engaged in beating off the "bugs" with small sticks, and catching them in milk cans; now and again emptying their prey into the fire over which soap was in the making, or pig's food in the cooking. "*All was fish that came to net,*" and so beetles and their parasites—"friends and foes," were—

——— "in one red burial blent."

Men are sometimes surprised to find the potato-beetles feeding on the tomato and tobacco plants in their gardens. The insect in its native haunts fed on the wild potato, *Solanum rostratum*. Of the *Solanceæ*, or Nightshade Family, to which the potato belongs, there are in north America six genera—not counting the South American genus Petunia, now so largely cultivated in gardens. They are (1) *Solanum*, nightshade; (2) *Physalis*, ground cherry; (3) *Nicandra*, apple of Peru; (4) *Hyoscyamus*, henbane; (5) *Datura*, thorn apple; (6) *Nicotiana*, tobacco. The first of these includes the potato, the egg-plant, and the tomato, all of which are eaten with avidity by the beetle. Deprived of its favourite supplies, the insect turns to such other members of the family as may grow within its reach. I have found it upon Physalis and Datura, as well as upon Nicotiana.

Of enemies working covertly, the cut-worms are among the most troublesome. They are larvæ of certain kinds of Noctuid, or night-flying moths. Whenever a farmer sees a blade of corn falling over and turning yellow, or a cabbage-plant bitten off near the ground, he may be very sure that a cut-worm is working there, and should use a spud or

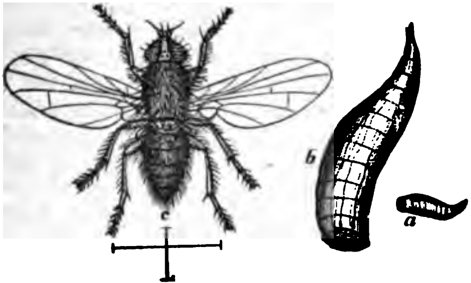


Fig. 14.

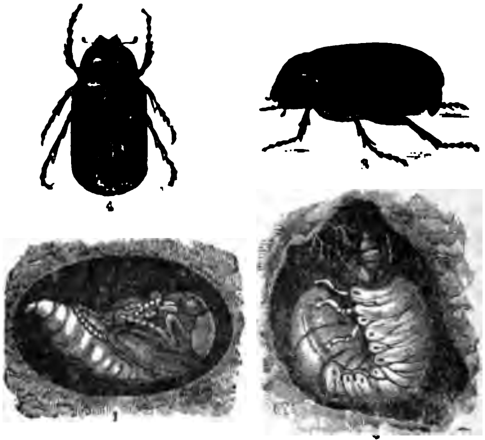


Fig. 15.

stick to unearth the spoiler. To foil these pests the young plants should be up as soon and as far as possible, for the creatures crawl over the surface, at d cannot ascend a mound of crumbling earth.

ng onions are damaged both by the cut-worms and by the maggots of the onion- *bia ceparum* Meigen (Fig. 14). The former work singly ; the latter, in groups. uld be carefully dug out and destroyed. Dry soot scattered over the onion-bed d to be serviceable in keeping away the fly.

"white-grubs," or larvæ of the May-beetle, *Lachnosterna fusca*, Frohl. (Fig 15) known pests. In the fields the plough unearths them ; and the poultry, follow- s wake, hold high carnival, and become fat and well-liking. In a thoroughly- arden the grubs find but little harborage.

hidden pests above mentioned can be dealt with more easily than some others.

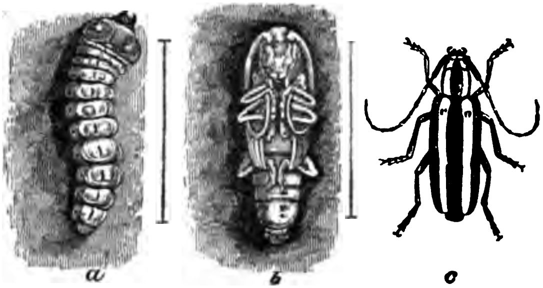
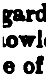


FIG. 16.

apple-tree borer, *Saperda candida* Fab. (Fig. 16), works near the ground, in es, and so weakens the stems that sometimes, in a high wind, the trees are snapped larvæ betray their presence by their *frass*. When this is the case a wire should t into the tunnels, for the destruction of the occupants. A thick wash of soft lied to the stems in June will deter the beetles from laying their eggs upon

re are other borers that injure other trees. It is in search of these that the ters work so systematically around the stems. The woodpeckers are among the wer's allies, and should not be molested.



The borer of the currant stems is the larva of a pretty little clear-wing moth, *Ægeria tipuliformis* Linnæus (Fig. 17). Late in the fall all unhealthy-looking stems in the red, white and black currant-bushes should be cut out and burned. The moths appear in June, and consort for safety with the small black wasps of the genera *Odynerus* and *Gorytes*, which they somewhat resemble. A child can soon learn to distinguish them from these, and can spend a few bright midday hours profitably in capturing the th a butterfly net. The capture of one female will save many currant stems age.

have, then, glanced at some of the worst of the insect pests that frequent the garden. The study of them in their native haunts will be found full of interest, owledge of their proceedings and the various methods of counteracting them, e of great value, and ought not by any to be lightly esteemed.

ON THE NOCTUIDÆ OCCURRING AT TORONTO.

By ARTHUR GIBSON, TORONTO.

some time past, in fact ever since the season of 1896, I have considered the to be my special favourites amongst the Lepidoptera, and in view of this I a few remarks under the above heading might interest those present.

The Noctuidæ comprise that large family of Lepidoptera known as the "Owl-let" moths, or night-flyers. As a rule, the members of this family feed by night and rest during the daytime. Some of the larvæ of these moths, commonly known as cut-worms, are amongst the most destructive of our caterpillars. The ravages which they have been recorded as making, resulting in the losses of certain agricultural products, have been enormous. Around Toronto, as far as I know, their devastations have not amounted to very much, comparatively speaking. In the regions most infested with these pests, the loss to agriculture is tremendous, but the ravages thus caused have been reported so fully in Government publications that it is not necessary for me to say anything further about their destructive propensities. It might not be out of place, however, to mention that on account of these larvæ being night feeders, all of their devastations are perpetrated after dark, in the daytime the caterpillars hiding under crevices, stones or any other article under which they can escape notice.

To the collector of these moths there are various novel ways of procuring specimens. The two most indulged in, in Toronto, are taking advantage of the electric lights, especially in the outer districts, and by the still better way of "sugaring" the trees. In the early part of the season, say until towards the last week in June, the Noctuids that are then flying seemingly prefer the electric lights to the "sugar"—such is my experience. By the first of July they start to come to the "sugar," and from then until the end of August, and even beginning of September, lots of good work can be accomplished. Some Noctuids which are often taken at "light" are seldom captured at "sugar," while on the other hand specimens like the catocala are generally taken at "sugar." Relicta (Fig. 18) is about the only catocala which I have noticed around the lights to any extent. During the end of August of last season quite a number of Relictas were to be seen at "light," while I have, as yet, only met with one specimen at "sugar." Collecting with the aid of "sugar" is much the better way, not only as regards the number of specimens taken, but also in view of the variety of Noctuids secured. The season of 1897 was an ideal one for "sugaring" purposes in Toronto. One evening as many as 26 specimens of catocalæ were taken by Mr McDunnough and myself while out together, besides a large number of smaller interesting Noctuids.

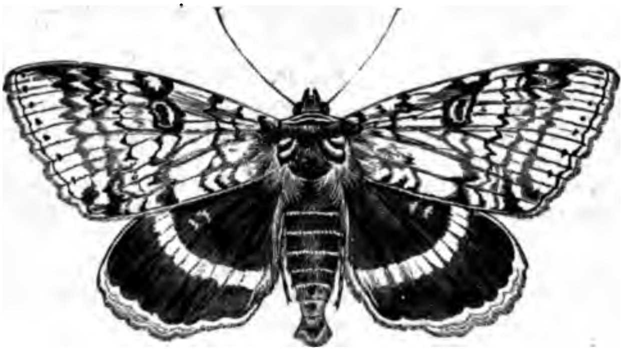


Fig. 18.

It is safe to say that among the Noctuids we find some of our most beautiful moths, but on the other hand some of them are most inconspicuous in color, being of a dull gray, brown, or black, or these colors combined.

In North America, according to Prof. J. B. Smith's List of Lepidoptera of Boreal America, there are recorded no less than 1841 distinct species of this great family of Noctuidae, and since the compilation of this list there have been several new species described. On my list I have marked off about 160 different species, which I have taken at Toronto, besides quite a number of unnamed species. Probably there occur several hundred more representatives.

Among the various genera there are to be found some very interesting species. The first thing I have marked of on my list is Raphia frater. This moth is of uncommon occurrence, the specimens I have being taken at light.

The genus Acronycta is an interesting one, some of the members being beautiful insects. Around Toronto, I have taken 10 different species, viz., occidentalis (Fig. 19),

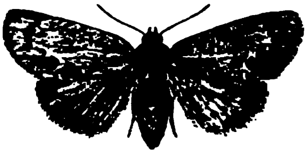


Fig. 19.

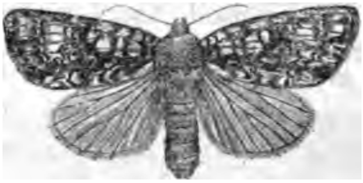


Fig. 20.

morula, populi, Americana, dactylina, hastulifer, luteicoma, brumosa, superans (Fig. 20), and funeralis. Of these probably funeralis is the most rare, while morula, dactylina and luteicoma are very scarce.

Harrisimemna trisignata, the only one of the genus, is a rather pretty moth; the three specimens I have were taken at light.

It is not necessary for me to mention every species of Noctuidae which I have taken, so I will just confine myself to the names of those which to me are considered of rare and of uncommon occurrence in the neighborhood of Toronto. In cases where it is possible I have mentioned whether the specimens were taken at "light" or at "sugar."

Microcoelia dipntheroides, fairly rare, taken at light.

Rhynchagrotis cupida, at sugar, very few taken. First time I took it was in 1896; very scarce since then.

Semiophora tenebrifera, one specimen at light.

Feltia venerabilis, only one specimen, taken at light.

Dicopis Grotei, one specimen taken at sugar, 13 June, 1896.

Mamestra imbrifera. Took one specimen of this beautiful insect, resting on the trunk of a tree, on the afternoon of 18th July, 1896.

Mamestra purpurissata, 1 sp. at light.

Mamestra grandis, 2 sp. at light.

Mamestra adjuncta, 1 sp. at light.

Mamestra latex, 1 sp. at light, 30th May, 1895, and one 9th May, 1896.

Mamestra rosea, very rare, two sp. at light, last capture 26th May, 1897.

Hadena lignicolor, rather uncommon, taken at sugar in June and July, 1895.

Dipterygia scabriuscula, 2 sp. taken at sugar.

Prodenia flavimedia, one sp. at light.

Trigonophora periculosa, 1 sp. at sugar and 1 at light.

Helotropha reniformis, fairly common, at sugar in 1896, rather scarce since then.

Hydroecia velata, 1 sp. taken at light.

Hydroecia cataphracta, 1 sp. at light, 9th May, 1894.

Pyrrhia umbra, 2 sp. at light, 4th May, 1896, and 2 sp. of the variety angulata on 20th June, 1896.

Orthosia ferruginoides, 2 sp. taken 21st Sept., 1895.

Scopelosoma Moffatiana, one of the early appearing Noctuids, 2 sp. taken at light, 20th April, 1896; also observed last season.

Scopelosoma ceromatica, also an early Noctuid, 4 sp. taken at light, 20th April, 1896. I have never taken either of the last two named, in the fall of the year, although I understand they hibernate in the imago state.

Calocampa curvimacula, very nice thing, 2 sp. taken at light, 20th April, 1896, and 1 sp. 17th May, 1897.

Cucullia asteroides, 2 bred specimens.

Cucullia intermedia, 3 sp. at light, 2 on 20 April and 1 on 16th April, 1896.

Among the Plusias there are some fine things. I have taken 8 different species marked off on my list, viz, ærea, aereoides, balluca (Fig. 21), striatella, bimaculata, precationis, ampla, and simplex (Fig. 22), together with one un-named. Of these striatella, balluca, and ampla are the rarest, with simplex and precationis the commonest. All my Plusias were taken at light.

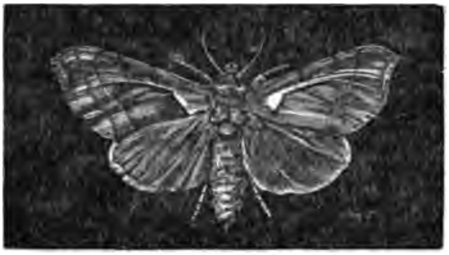


Fig. 21.

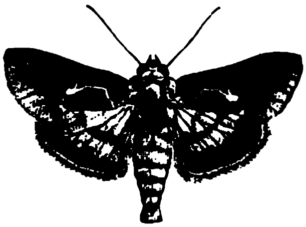


Fig. 22.

Heliothis armiger, one sp. taken 22nd Sept., 1895.

Alaria florida, very pretty moth, 4 specimens taken at light in 1894, never very common.

As to the Catocalas, I have taken 14 different species at sugar, the principal captures being, grynea, ultronia (Fig. 23), a beautiful variety of ilia, briseis, relicta, (Fig. 18), habilis, neogama (3rd Aug., '96) and retecta. The season of 1896 was by far the best I have yet experienced in collecting Catocalas, such species as ilia, cerogama, uniguga, and parta (Fig. 24) being very common. During the past season I did not notice a single specimen of ilia. I understand that C. cara was taken in Toronto last season.

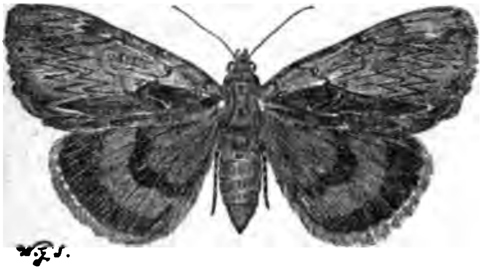


Fig. 23.

Panopoda rufimargo, one specimen, taken at light.

Homoptera nigricans, one specimen at light.

Bomolocha baltimoralis, 2 sp. at light.

Brephos infans, one specimen taken on 11th April, and one observed on 16th April, 1898.

I have brought to the meeting some of the species mentioned in my paper, also a few "uniques" which, as yet, I have not got identified. Some of these will no doubt interest certain of the members present.

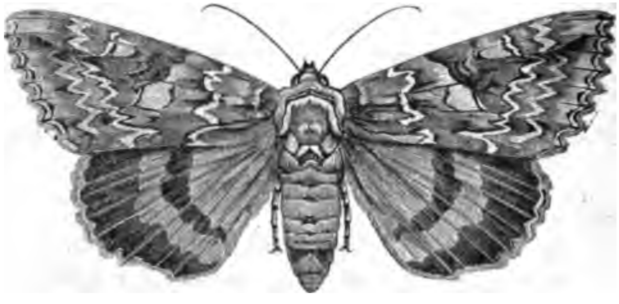


Fig. 24.

At a future date I may be able to relate, in a much better manner, something on the "Noctuidae occurring at Toronto," which may be of more interest than the article I have just read.

Mr. Gibson also exhibited specimens on the following very rare butterflies which he was so fortunate as to have captured at Toronto : Thecla Ontario, Pamphila Baracoa and Brettus ; also Pyrameis carye, which was taken by Mr. Tyers. T. Ontario has only been twice taken before in the Province from which it is named ; the other three are new to our Canadian list.

Mr. D. Brainerd disagreed with the writer of the paper regarding the superiority of light to sugar as an attraction for moths. Mr. Winn said that he had found sugar the best bait until June 15th, but after that flowers were the most attractive. He had taken 160 specimens between 7.15 and 8.15 one evening.

THE COLLECTOR AND HIS RELATION TO PURE AND APPLIED ENTOMOLOGY.

By F. M. Webster, Wooster, Ohio.

The insect collector may or may not be a professional entomologist. He may be a minister, doctor, lawyer, merchant, soldier or sailor. He may be confined within the walls of a counting-room, bank, office, study or other place of occupation, during eight or ten hours of the six days of the week, for eleven months of the year, or he may be camped for months in the wilderness, or spend months on the sea, with an occasional respite of a few weeks on shore. There are few professional collectors, the major portion of these being engaged in other pursuits, and spending the time generally devoted to rest or recreation by the majority of people, in the collection of insects, in itself a most pleasing and healthy sort of recreation, provided ones tastes trend in that direction. Thus it occurs that a collector may be confined to a limited area, or he may be able to carry on his work in widely distant localities. I know of a soldier, wounded and in a hospital, who managed to make a considerable collection of insects and especially such as are readily attracted to light, and another whose business, that of a commercial traveller, takes him from one end of the country to another. I have in my own collection, specimens taken at almost all hours of the day or night, under almost every condition imaginable, and in as great a diversity of localities.

Outside of professional entomologists, the collection of insects is largely a labor of love, with no hope or expectation of any compensation whatever. This, then, would appear to be the proper place to discuss the value of these self imposed labors to the science of entomology.

While much has been said and written, both pro and con, relating to the value of the services of those men and woman who collect but do not study insects, it has always appeared to me that in this, as in almost everything else, we should make a distinction between the careful collector and the one who, strictly speaking, could hardly be termed a collector at all. Of course industry and energy here as elsewhere, count for much, but care, neatness and accuracy are imperative. Then, again, there has existed a certain condition of affairs, happily now fast disappearing, under which a collector was obliged to humbly submit his hard earned material to a specialist for determination, which specialist, after condescending to go over it, retained the specimens for his trouble, and in the case of new forms, frequently forgot to give credit to the collector when naming and describing them. It was thought sufficient to state that specimens were from Canada, California or Texas. The description being sometimes drawn up from a single specimen, thought to be typical of course, because it was the only one in the hands of the describer, was often faulty, so that the danger to the pure science from discolored or deformed material getting into such hands was very considerable. It goes without saying if you place a lot of carelessly collected and prepared material in the hands of a specialist, who is simply a species maker, and whose judgment and accuracy is not above question, the result will be not only n. gen. et sp., *ad infinitum*, but time has shown that the sort of entomology that such work represents had best be spoken of in connection with an ?.

But this is one extreme and one that is fast being eliminated, all specialists of repute now giving full credit to the collector for material placed at their disposal, and frequently this is done at the request of the specialist himself. It seems to me that this is one of the most encouraging evidences of progress in entomological research, as the collector soon finds that with credit there, invariably, goes more or less responsibility, and we therefore get better and more careful collecting, while the specialist or systematist is placed in possession of better material and more elaborate data, and is thus better enabled to avoid mistakes and synonyms. But we must not lose sight of the fact that this material and data must be supplied by the collector, who may be so situated that he is not able to work up his material properly, while the systematist is often equally unable to secure these by his own efforts; and we thus have a division of labor, which, if faithfully carried out by both parties, can only result in much good, and material progress in our beloved science.

For my own part, I have come to look upon the labors of the careful collector, as having much the same relation to the science of entomology, as those of Livingstone and Stanley have to the advance of civilization in Southern Africa. These latter gentlemen did not fell trees and plow and sow, but they paved the way for these, and made civilization possible. The collector is the advance discoverer, who must be followed by the systematist before the biologist can commence his labors. We first must get our species, and then so define it as to prevent its being continually confused with other forms, else we cannot study either its own life or its relation to other species. In the history of the advance of civilization we have, first, the discoverer, next, the pioneer agriculturist with his log cabin, followed by cities and schools and churches and railways, all the accompaniments of civilized life, but all preceded by the one who first made his way through the trackless wastes and told of what he saw.

Now, about the collector and his work. He who cares nothing for habits, variations and geographical distribution, will accomplish the least for the advancement of the science, though, as has been stated, industry and push are neither one to be despised, and it is better to know that certain species are to be found in Canada, California or Texas, than not to know of their existence at all. It would be much more satisfactory to know just where in these areas the species were found, as all extend over a wide area and great variety of country. But just here let me call attention to a serious defect, and one that does not seem to be confined to the careless or inexperienced, viz., giving as localities of occurrence, isolated points, having local names which are unknown a few miles away, and are not to be found indicated on any of our maps. Such give no clue whatever to the one who is engaged in tracing out the geographical distribution of a species, as I have myself experienced after hours of fruitless search, finally giving up in despair. In all cases it is better to give exact localities with reference to their proximity to some point which is indicated on our maps; the approximate latitude and longitude will be the most stable and valuable of all, as the information can be used in any country and by the aid of very ordinary maps and charts. To those who object to taking the trouble to do this, let me suggest that other entomologists will there take up our work after we have followed Harris, Fitch, Riley, and more recently, Lintner and Maskell, on that long journey from which none return. We cannot, now, see what problems those who are to follow us may have to solve, nor can we determine the nature of the data that will be required for such solutions. Then, too, the foreign entomologist has frequently to turn to us for information regarding the distribution of both species and genera, and it is but justice to our fellows if we present our data in a manner that will be most intelligible to them. Some very good collectors, and not all of them American either, have overlooked this matter, and as a consequence we are sometimes left in the dark where we most needed light, and our colleagues really intended to supply it to us.

Altitude will not come amiss when you go over your notes, possibly twenty years hence, while food plants, food habits, relative abundance, and, indeed, almost any facts relative to the "sociology" of a species will be sure to be of use sometime, for someone. I am continually using data secured ten, fifteen, or twenty years ago, some of it at the time seeming to be hardly worth recording, but it is surprising how many good things way of specimens and facts we are continually turning up, by accident, as it were, times not realizing the full value of our "find" until years afterwards. A careful, ul observation is never without value, as it either brings a new fact to light or else antiates an old one. Insects do not necessarily act alike over the entire area of distribution, and the man or woman who uses their own eyes is almost sure to see thing that has not before been observed. Why! I have gone to your fellow member, V. H. Harrington, again and again for facts regarding some of our insects that I been observing for years, but he, with his close observation, has observed things if they were to be seen in my locality, were overlooked by me. We do not see every- going on about us, by any means, even we that are most in the field, and I have several hundred miles from home, and found certain insects there doing certain s that they were not observed to do at home, but as soon as I returned they were l to be engaged in precisely the same way that I had observed them elsewhere, and ıbly had been doing so all the time, but I did not happen to be a witness to the

Of late we are hearing much relative to life zones, and, while it is hardly probable we have at the present time sufficient definite information regarding the exact local- of occurrence among insects to enable us to say much in regard to these, as it is easy to say too much, yet we all know that our species are not all of them generally .buted. Almost every collector will get species in his immediate neighborhood, times in abundance, that are to be found rarely, if at all, elsewhere. There are cer- areas, over which a certain species will be found to occur in a greater or less dance, while a few miles away it will appear to have given way to another. In st every locality there is sure to be some particular spot that will be found especi- ich in insect life. These favored spots may be a bit of woodland, a bank, a shaded e or a secluded valley, to which one can go with the assurance that he will secure thing rare or new. The vegetation here may not differ materially from that of hun- of other places, seemingly equally favored also by climate and elevation, yet a er number of species seem to have gained a foothold, so to speak, here than else- e, and, somehow, are able to retain their hold. Just why this is true is not exclu- an entomological problem, but involves animal and vegetable life as a unit, and the t collector can, if he will, pile up facts that will go a long way toward the settle- of problems not at present considered in connection with entomology at all. In words, before we can do much with mapping out life zones, we must have a vast ınt of information that can only be secured by the careful collector and observer. only must this data be secured, but it must be made available by being placed on d where it can be found by the great army of scientific men and women. I am well e that there is in some quarters, an aversion to publishing detatched notes and obser- ns and a tendency to hold fast to all such until a mass of material is thus secured ient for an extended and exhaustive discussion, but it has always appeared to me in ferent light. Let us suppose that the science of entomology is an immense vase, as as Ætna or Vesuvius, and this is shattered into fragments and scattered over the of the earth, and entomologists, without definite knowledge of its original form or nsions, are set to work to gather up these scattered fragments and reconstruct the The fragments will of course be of every conceivable size and form and when ght together fit into each other perfectly, but many of them will be much alike in so that the misplacing of a fragment will not infrequently occur, the mistake only discovered by the proper one being found and fitted into place. A fragment may de a species, or any fact connected with its life history or habits. Now, let us sup- that a collector in Canada or elsewhere discovers a new species, while an entomo- in some distant part of the world discovers an allied form. Here are two frag- s of science, separated, how widely we cannot know, until the intervening space has filled in by collections, breedings and observations carried on by perhaps a dozen ent individuals, possibly speaking half as many different languages, each contribut- is fragment that is to fill in the space that divides the two forms and cements the together, so to speak. Let me illustrate again, taking this time *Diaspis amygdali*, which has recently been discussed by Mr. Cockerell, Mr. Tryon, Mr. Lounsberry and myself, each presenting some new phase of its habits in various parts of the world. But one of my contributions related to a parasitic foe, described by Dr. Howard and reared by myself from the Coccid just mentioned, on trees recently imported from Japan, and also by Professor Marchal in Paris, Mr. E. E. Green in Ceylon, the late Mr. W. M. Maskell from Coccids received by him from Sydney, New South Wales, and at the United States Department of Agriculture, from an Aspidiotus from Georgia. Here we have fragments of our imaginary vase gathered from all quarters of the globe, not only fitting into the Diaspis fragment, but into others as widely separated as well. But suppose each one had kept his fragment to himself until such time as he could secure sufficient material for an exhaustive paper; how long would each have stood in the way of the other in attempting to make use of his information? "Rushing into print" is not to be commended, but a collector owes it to his fellows, and to entomology in general, to collect carefully and make all possible observations in connection with his material, placing the former on record for the benefit of his colleagues. The value of such work as is being done by Messrs. Harrington, Kilman, Bean, Fletcher, Lyman, Fyles and other Canadian entomologists, is not to be measured by our present knowledge, nor are the facts gained by these gentlemen to be taken separately, for, individually, they may be nearly or quite worthless and yet contain the very missing link that some other worker is hunting for, and through the lack of which he is unable to proceed in the solution of his own problem. Isolated from his fellows, working for the love of nature with little or no encouragement from those about him, it is not to be wondered at that a collector should think only of himself and his individual pleasure, becoming satisfied with dried corpses pinned in his cabinet and caring nought for the habits of these forms of life when active. But there is a world of riches at the door of every collector, isolation frequently becoming a blessing in disguise, for if he will but keep his eyes open and tell the world what he sees, he will ere long be surprised at the wealth of facts that he will accumulate.

The unknown in entomology may be likened to an ocean whose shores are lost in infinity, while the known is as a mill pond. There is so much to observe, so much to learn and life is so short. The collector, more than any one else, has opportunities for observation such as, if made with care and accurately recorded, may outweigh volumes of compilations that are too frequently permeated by the opinions of men, while original observations come direct from the hand of the Creator.

In conclusion, then, if there is any kind word of encouragement or of admonition that I can offer to the collector, whether he be located in city or country, let me do so here. Gather up these fragments of which I have been telling you, as you would grains of gold from among the sands, for sooner or later there will be a mint open for their reception and you will be surprised at their value. You will be more than once astonished to find that what you took for a worthless, fragmentary observation, will really turn out to be the keystone of an arch which has long been unfinished for lack of your fragment.

ENTOMOLOGY IN SCHOOLS.

By Wm. Lochhead, Ontario Agricultural College, Guelph.

The Annual Reports of this Society for 1896 and 1897 contain several very suggestive papers relating to the study of insects in our schools. Ex-President Dearness dealt somewhat fully with the subject in his two Presidential addresses, and the late Professor Panton outlined a method of presenting the subject from an economic standpoint. These three addresses, I remember, gave rise to a discussion among the members present on those occasions, and showed plainly that the time was ripe for introduction of nature-study into our schools. The members were unanimous in the opinion that insect life should form a portion of the children's study, at least, in our rural schools.

Mr. Dearness deserves much credit for his efforts towards the introduction of nature-study in his own County of Middlesex, and, in a general way, throughout the Province of Ontario. It is to be hoped that a little leaven will leaven the whole lump, and that every County Inspector will endeavor to the utmost to further this most desirable object. The compulsory study of Botany in the lower forms of our High Schools has already paved the way to a partial recognition of nature study as one worthy a place in our school curricula.

As a teacher of science for several years in some of our largest Collegiate Institutes, I may be permitted to use whatever influence I possess in urging on this good work, and towards this object this paper has been prepared.

This paper will consider the subject under the headings *Why?*, *How ?*, and *When ?*, *i.e.*, why should teachers introduce the study of insect life into their schools ? Supposing its introduction is a wise procedure, how should it be taken up ? and when should it be taken up ?

WHY ?

1. Because the study of insect life trains the eye to see, and the mind to draw proper conclusions from certain observed facts. The child learns clearly the relationship between causes and effects. It is remarkable the number of people who jump at conclusions without taking the time to relate cause and effect. Traditions and superstitions are still rampant, and many erroneous ideas of our forefathers are still too often accepted as truth in spite of the great advances that science has made during the last fifty years.

Pupils properly guided in their observations of nature will soon correct for themselves many of the errors that imperfect observers have made, and which have been handed down as truths. When the pupils have grown older, and have become engaged in the various pursuits of life, where alertness of mind, close observation, and accurate deductions count for much in the struggle for wealth, those who have been most carefully trained while young will, other things being equal, be most likely to succeed. It is a case of survival of the fittest in a struggle for existence. Comparisons, relations and judgment which are cultivated by a proper study of insect life are indispensable to the successful farmer, merchant and statesman. "If the farmer's boy learns how to accurately observe the process of nature with which farm produce deals, and the foes with which agriculture has to contend, are not the chances vastly increased that he will be successful in managing nature so as to get the greatest favors from this coy mistress of his life and fortune ? "

2. Apart from the direct bearing on a successful life from a commercial standpoint, the study of nature reveals beauties and wonders all about us. Our eyes are opened to the wondrous transformation of insects, to the inter-relationships which exist between plants and insects, and among insects themselves. These are subjects of perennial interest, and the persons who have observed nature carefully will find in her not only " a resource and recreation, but an ever-faithful friend holding out comforting arms to those who are weary in soul and body." I think no one can be unhappy who has a true friend in nature, and can establish a living sympathy with everything about him, for Coleridge says :

" He prayeth best who loveth best
All things, both great and small ;
For the dear God who loveth us,
He made and loveth all."

A writer with wide experience says : " The element of education which is at present most lacking in our common schools is the training of the powers of observation. The children need above all things else to be taught to observe carefully and correctly and to state their observations in clear and terse language. The ordinary child, whether on the farm or in the town, actually sees comparatively little in the world about him. The wonders of the trees and plants in park or meadow, of birds and insects flying about the house, float like shadowy visions before his eyes. " Seeing, he sees not." He needs a teacher who can open his eyes and fix his mind on the realities among which his daily life is passed. This accurate observation of natural objects and facts is the only foundation on which scientific attainments can rest. The scientist is chiefly a man who sees better than his fellow men. But it is also a great help in practical life.

3. "No branch of science means more in actual dollars to the people of the country than Entomology. At least one-tenth of our crops is lost owing to the depredation of insects." It is surely a proper thing to instruct our children about the insects. They should learn to distinguish insects which are enemies from those which are friends. If our farmers and gardeners understood the method of dealing with the foes, and acted promptly and efficiently, the money value of this knowledge and action would equal the richest Klondike ever discovered. When Governments spend millions, and individuals risk their lives in opening up a mineral Klondike, it is not unreasonable to ask that more attention be paid to this insect Klondike at our doors. Let us educate the children to take an interest in insects, for in a few years they will have the control of the great money-producing areas, viz., the farms of our land. Dr. Fletcher has already treated of the value of Entomology from an economic aspect at a previous meeting of this society, and Mr. C. C. James, the Deputy Minister of Agriculture of Ontario, has also ably handled the subject in several addresses before Farmers' Institutes.

How.

Every good teacher will have his own method of presenting the subject, the one best suited to his own individuality, but there are general principles which he must follow:

1. As far as our rural schools are concerned, Entomology should be studied "without reference to systematic order or relationships." The whole study should be thoroughly informal in every respect; it should be natural. No stated lesson should be assigned as a task beyond the general collecting of insects which the teacher may ask to be done occasionally. At first the teacher will simply guide the pupils by adroit questions such as these: Where did you find it? What was it doing? On what plant did you find it? Did you see it fly? How did it fly? Did you hear it sing or chirp, etc. The difference in structure among insects brought before a class should also be studied by means of questions put by the teacher, the number of wings, legs, and eyes, (Fig. 25) its mouth, and its breathing apparatus. The pupil will soon see that insects are unlike in many features, the observation of which will tend to increase his interest.

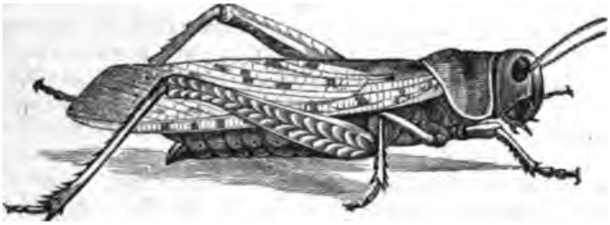


Fig. 25.

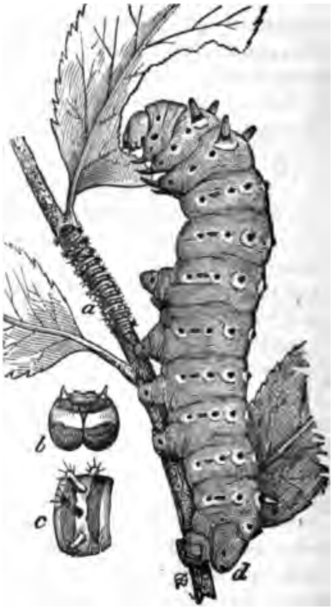


Fig. 26.

Occasionally injurious caterpillars will be caught in the act of eating leaves (Fig. 26); this occasion should be well used by the skilful teacher, and useful lessons learned. It is wonderful what a variety of insects will be forthcoming when the interest of the pupil is thoroughly aroused. Very often the best teacher will be incompetent to answer all the questions asked him by the curious naturalists, but that should not deter him in his work, for even experts will very often tell of their ignorance in matters relating to insect-life.

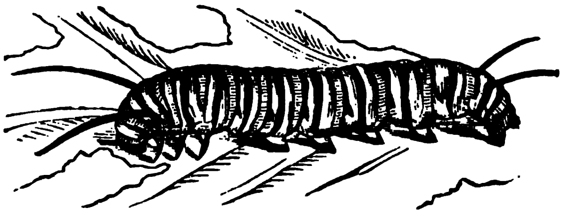


Fig. 27.

2. Encourage the pupils to make collections. Mr. Dearness has explained very clearly in his last year's Presidential address the simple method of collecting, so that every teacher who feels a living interest in this informal work, will find no difficulty in equipping both himself and his pupils with the necessary appliances.

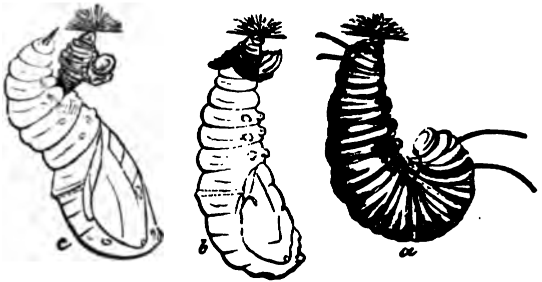


Fig. 28.

3. Encourage the study of life-histories, for after all this part is the most important in every respect. The wonderful transformations should excite intense curiosity, and accuracy as to the observations forms one of the most valuable trainings to be obtained in any department of science. (See Figures 27-32).

Fig. 27, the caterpillar ; fig. 28, the caterpillar changing into a chrysalis ; fig. 29, the chrysalis ; fig. 30, the perfect butterfly.

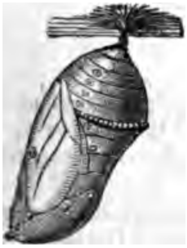


Fig. 29.

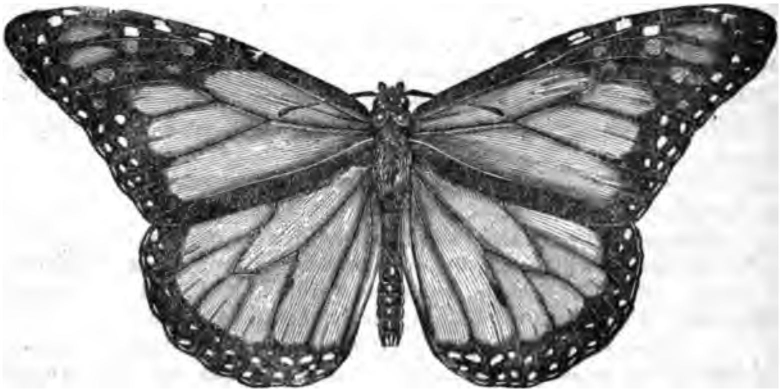


Fig. 30.

4. Make this nature-study the basis of composition lessons, and informal talks, where good English form and style must be insisted upon. A child full of enthusiasm for a subject cannot help but talk, and write too, if required to do so. Let abstract and foreign topics alone till his reading has become wider and his mind more fully developed

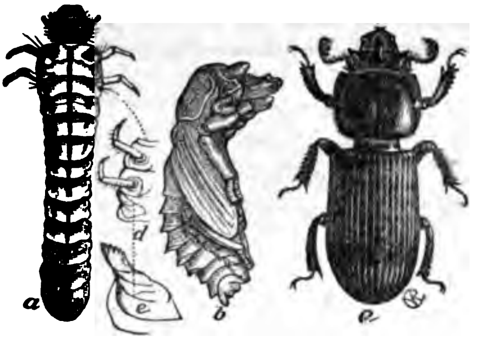


Fig. 31, grub, pupa and beetle (Passalus Cornutus).

The logical expression of the sequences in the development in insect life, if repeated frequently, will become one of habit, and will tell powerfully in many other ways. Not long ago the Principal of one of our largest Model Schools stated to me during a conversation, that almost invariably he could pick out the teachers-in-training under him who had received a science training in the High Schools. Science-trained pupils could develop a lesson along natural lines in proper logical order, so that they were thoroughly pedagogical in all their work.

5. Let the study of insects be one of relaxation from the more arduous duties of the school. The pupil must never have "Examinations" on the subject, else the knowledge of facts will soon be considered by pupils the chief aim of the study. Even the observations to be made must be incidental, just as the questions must be informal.

The child mind craves for informal instruction along such lines, and "the school becomes a delightful place, and the teacher an angel of light."

WHEN?

The amount of time allotted to this study should not be much. Let it creep in whenever the teacher feels that there is a need of relaxation, or when he has material for a good lesson. Some have advocated devoting a period to the work on Friday afternoons, but I would not limit the period to any particular time. It should not appear at all in the programme of studies. The youngest child is not too young to make observations and to try to give explanations.

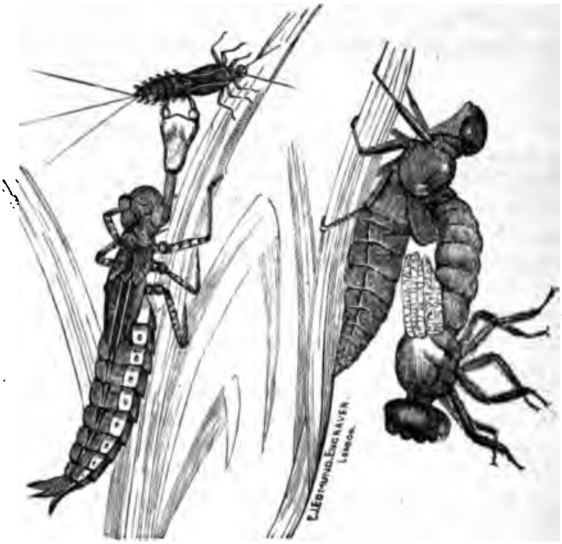


Fig. 32, transformations of a Dragon-Fly.

TEACHER'S EQUIPMENT.

The greatest difficulty at the present day is to secure properly equipped teachers. This difficulty will gradually disappear as nature-courses are placed on the curricula of Normal and Model Schools, but a few words, I think, will not be out of place here regarding books with which the nature teacher should be familiar.

1. Comstock's *Insect Life*, published by the Appletons, is the best hand-book of suggestions, directions and methods for teachers that we have in America. Outlines of studies are given on pond life, brook life, orchard life, forest life and roadside life, while methods of collecting and preservation of specimens are sketched very clearly. Price $2.50.

2. Comstock's *Manual for the Study of Insects* takes easily first place as an Identification Book, and should be in every Entomologist's library. It contains keys to the

orders, and families, and gives brief descriptions and engravings of nearly all the commonly occurring insects. Price, $3.75.

3. Prof. Panton's *Insect Foes* (30c.) is a very convenient book for the busy man who would like to know the most injurious insects and the methods used in destroying them.

4. *Insecta*, by Hyatt & Arms, is a very neat and interesting book for beginners, and pays much attention to the anatomy of types from each of the orders. Price, $1.25.

5. Scudder's *Guide to Butterflies* and *Life of a Butterfly* are very useful books. The former pays much attention to identification of larvæ. Price, $1.50. Also Dr. Holland's *Butterfly Book*, with 48 coloured plates. Price, only $3.00.

6. Other special works are: *Williston's Diptera*, $2.25; *Cresson's Hymenoptera*, $3.00; *Leconte & Horn's Coleoptera*, $2.50; and *Banks' Neuropteroid Insects*, 50 cents; and *Packard's Works*.

7. In Economic Entomology there are Saunders's Classic Work, *Insects Injurious to Fruits*, price, $2.00; Harris' *Insects Injurious to Vegetation*; Smith's *Economic Entomology*, price, $2.50; Weed's *Insects and Insecticides*, price, $1.50.

8. Last, but not least in importance, are the *Annual Reports* of our own Entomological Society, in which will be found splendid accounts of the injurious insects from year to year. Every teacher should subscribe for the Canadian Entomologist, $1 00 a year; for in doing so he would get twelve monthly numbers of the Magazine and a copy of the Annual Report of the Society's Proceedings.

TWO AVIAN PARASITES: NOTES ON THEIR METAMORPHOSES.

By R. Elliott, Bryanston, Ont.

In the month of April, 1897, I noticed among the feathers of a Broad-winged Hawk which I was making up as an ornithological specimen several examples of a medium-sized fly that, judging from its peculiar structure, the faculty it possessed of passing rapidly through and hiding among the feathers, its reluctance to leave although provided with well-developed wings, must be a parasite, alive and well and quite at home.

Looking at a species of the highly organized order Diptera, in which the metamorphosis is complete, my first surprise at seeing the insect there soon merged into the second wonder: If the parasite remains for life on the host, and the metamorphosis is complete, in what manner is the routine of reproduction carried on? One could easily imagine eggs deposited on the feathers, an excellent environment to ensure development. But then, what would become of the larva? One could scarcely conceive of a maggot as living on the exterior of a living bird.

[In a Catalogue of Insects, under the family *Hippoboscidae*, I found *Olfersia Americana* Leach noted thus:—"Lives on *Bubo virginianus* and *Buteo borealis*."]

As the Broad-winged Hawk is a near relative of the last-named, is in fact *Buteo latissimus*, I assumed that I had found the name of the insect.

In September of this year, while manipulating a White-throated Sparrow for the same purpose as my hawk, I found another parasite fly, possibly of the same family, but of a different species from the first-named. It measured about five millimeters in length, with wings nearly, if not quite, as long as head and body. The thorax was flat and smooth; the skin leathery and tough; the legs (a light olive-green) long and strong and provided with curved hooks—an admirable contrivance to enable the parasite to travel through the maze of feathers while the troubled host travelled through the mazes of the northern forest.

Through the kindness of my friend, Mr. Dearness, I am enabled to present herewith a drawing made by him under the microscope, which shows the structure of the fly's foot. (Fig. 33.)

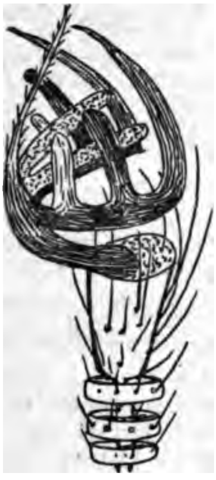


Fig. 33.
Foot of Parasite of White-throated Sparrow.

The most interesting feature of the particular specimen described above lay in the fact that when found its condition gave me hopes that I might receive some light on its method of reproduction. Its abdomen was much larger in proportion than that of its congener found on the hawk.

Having placed the fly, living and uninjured, in a small phial, I watched and awaited developments. Within twenty hours I found the fly dead at the bottom, and a single large pupa (Fig 34) sticking to the side of the bottle. As it appears incredible that the young could have subsisted by itself in such a place, it seems reasonable to conclude that the egg and larval stages were passed within the body of the parent, thus accounting for two important phases in the course of its life. The pupa measured 2½ x 2 millimeters, blackish brown, smooth and shining, flattish, oval, suggesting in form and outward structure some minute trilobite.

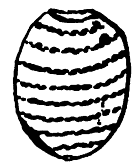


Fig. 34.
Form of the shining black pupa.

Mr. J. Dearness submitted the specimens of the two parasitic insects, and the curious larva, adding the following notes :

With the specimens submitted herewith, Mr. Elliott has afforded some of us our first opportunity of examining a pupiparous insect. He shrewdly suspected the curious fact in the life history of the insect under notice that the earlier metamorphoses take place in the abdomen of the parent, and that the young insect emerges therefrom in the pupal stage. The adhesiveness of the pupa, as shown by its sticking to the side of glass bottle, may be an important agent in keeping the pupa among the feathers during the brief time between its expulsion and its exit as an imago.

The only book I had at hand at the time of making these notes which relates anything of the Pupiparæ was Van der Hoeven's. Speaking of the Pferde-laus (*Hippobosca equina* L.) he says: "If we were told that a bird laid an egg that produced a young one at once as large as the mother we should think the account fabulous and ridiculous; the fabulous part would not be diminished were the bird ever so small, or even a winged insect. Of this insect—the Pferde-laus—the story is actually true."

The smaller of the two parasites was the one that deposited the pupa in the bottle; it is in the genus *Ornithomyia*, Latr., and is characterised by having distinct eyes, ocelli usually three, wings distinct, claws of tarsi tri-dentate. Hippobosca has no ocelli, and the tarsi are bi-dentate.

The author above quoted says of the family to which these insects belong that they lay no eggs, but are viviparous. That which seems to be an egg laid by these insects, and which is sometimes as big as the abdomen of the mother, ought to be regarded as a pupa. From it the perfect insect (imago) comes to view after an interval of time dependent upon the temperature to which the pupa is exposed.

A BIT OF HISTORY.

By J. Alston Moffat, London, Ont.

Early in 1898 the Rev. Dr. Bethune had received an enquiry from Mr. H. Bird, of Rye, N.Y., concerning certain specimens in the Society's collection. The Doctor naturally referred him to me. Shortly after I received from Mr. Bird a letter enquiring if *Hydrœcia appassionata* Harvey, was represented amongst the species of that genius in our collection. I replied that it was not, and that I suspected that there was but one specimen of it extant; and that one was in the the British Museum; and that a re-discovery of it would be a matter of very great interest; and this opinion I afterwards found was also entertained by Mr. Bird.

This *Hydrœcia appasionata*, Harvey, is a species that was taken at London, by Mr. E. Baynes Reed, and described by Dr. Leon F. Harvey in the August number of the *Canadian Entomologist* for the year 1876, page 155, under the generic title "Gortyna." The date of the description indicating that the capture had been made the previous year at the latest. There is no mention made of the number of specimens taken, or upon which the description was made; the presumption is, that it was a unique. At all events, a type specimen had gone into Mr. Grote's collection; Mr. Grote's collection went to the British Museum, and that specimen went with it, and there I presume it is now. It has generally been considered that some of the species of this genus are rather variable and run closely into each other. Reference is made by Mr. Bird in his paper (*Can. Ent.* Vol. 30, p. 130) to the difficulty that seems to have been experienced by the describers in deciding to which species certain forms belonged. Guenee is reported as considering *Marginidens* Guen and *Limpida* Guen as possible varities of *Rutila* Guen, whilst Walker regarded *Marginidens* as a doubtful variety of *leucostigma.* I have read somewhere a statement made by Dr. J. B. Smith, that as the genus then stood a specimen might be yellow or mouse-colored, with or without spots and yet be the same species. Dr. Smith had been convinced that the genus was in a most unsatisfactoy condition and wanted revision, and he undertook the task. The first thing to be done was to get as much material together for study as possible, so early in the year he requested the loan of the Society's specimens of that genus for comparison. I replied, that then they would have to be sent by express, and that he would remember that the unreasonable demands of the U. S. Custom officers had erected an effectual barrier to anything more being sent in that way. I sent to him a list of the genus as it was represented in the Society's drawers, and from these he choose those he wanted most to see, and they were sent to him by mail. Amongst them were three specimens which I had under the specific name "Rutila." One was from my former Hamilton collection. Another was taken by Mr. C. G. Anderson, of London, in 1895. And as it did not correspond to anything I could find, it was sent for determination and returned as "Rutila." The other was a specimen taken by Mr. Bice in 1896, of which he took several that season, and as I could not identify it, I sent it also for a name, which was also returned as "Rutila." This I considered was an illustrious example of the variability of the species, and quite confirmatory of Dr. Smith's statement already referred to.

In due time the specimens were returned with Dr. Smith's determination of the various forms attached to them. In his letter to me of August 15th, 1898, announcing his returning the specimens he remarks: "The specimen of *Appasionata* is the only decent example known to me in collections. *Circumlucens* is a new species of which there are only a few other examples known to me. So, though the lot was small it was not without interest." So there had been an example of the long lost *Appasionata* in the collection and I did not know it. This specimen of *H. Appasionata*, Harvey is Anderson's capture of 1895. *H. Circumlucens*, Smith, is the specimen from my old Hamilton collection, and "*Rutila*" is the 1896 capture of Mr. Bice. It would then appear as if "*Rutila*" had been a kind of general repository for anything that was known not to belong elsewhere. I believe there are two or three other specimens of *H. Appasionata*, Harvey in collections in London.

By my ordinary method of collecting fall moths, searching for them in the daytime, or beating bushes and weeds; all species of *Hydroecia* seemed to be rare and difficult to find, except *Nictitans*, which is more or less plentiful every season; whilst other species are obtainable only in single specimens at long intervals. In Mr. H. Bird's valuable paper on this genus (*Can. Ent.* Vol. 30, P. 126,) mention is made of *Nitela* as being a well known species; here it is seldom taken, and its variety *Nebris* has yet to be reported present. Referring to *Cataphracta*, Mr. Bird says: "At light the Imago would be considered a rarity." Here it is the most abundant form presenting itself at light. Dozens of it might have been taken in the season of 1897. It was less plentiful in 1898. *Inquaesita* would come next in point of numbers. This is an illustration of changed results in different localities.

THE GYPSY MOTH.

By E. H. Forbush.

Ever since the Gypsy moth exterminative work was placed under the management of the Massachusetts Board of Agriculture the plan of operations has been to work from the outermost limit of the known infested region toward the centre.

Obviously such a method, if properly executed, would best carry out the purpose of the State law, first, for the prevention of the spread, and second, for the extermination of the moth. In accordance with this plan it has been the policy of the Board to clear the outer towns from the moth and, at the same time, to reduce, so far as the money granted would permit, the number of the moths in the central towns. It was hoped that when the outer towns were cleared the force could largely be concentrated in the inner towns, clearing them also. If the Board had each year received the sums it has deemed necessary and annually requested this policy would by to-day, it is believed, have been carried on to complete success. But since the necessary legislative grant annually asked for by the Board has been cut down year after year from one-third to one-half, the moths have so increased in the central towns that they have been scattered into and have seriously threatened the towns cleared or nearly cleared in the outer belt.

Under these circumstances it has been found necessary during the seasons of 1897-98 to concentrate large bodies of men in the central towns to prevent a further wide dissemination of the larvæ into the outer towns; the outer towns, meanwhile, receiving less than their full share of attention.

The present year the full amount asked for ($200,000) was granted for this work by the legislature. Unfortunately the grant was so delayed that much of the necessary work of egg-destruction (by burning, before hatching time) could not be done. The heavy rains, too, which prevailed through May and June greatly hampered the spraying. Nevertheless, the burlap-work, which was done more extensively than ever before and over most of the territory known as infested, proved so successful that nowhere in the whole burlapped territory were any considerable number of trees stripped by gypsy moth larvæ.

We have also this summer done extensive burning, beginning in August; burning will be continued where needed.

On the whole, the granting this year of the full sum asked will make it possible for us to accomplish far more in 1898 than has been accomplished in any previous year.

While it is true that two colonies of the moth (one in Lincoln, discovered in 1897, the other in Manchester, discovered this year) are known, immediately outside of the limits of the territory hitherto defined as infested, these discoveries, under all the circumstances, do not in the least surprise me, since I have believed from the first that a few of such extra-limital colonies might confidently be looked for. Still these discoveries emphasize the necessity of far more inspection work outside the limits of known infestation. We have been absolutely unable in past years, with the money hitherto granted, to do nearly all that needed to be done in this line of work. This year as much as possible was done in this line, revealing, however, no infestation.

Efficient work has been done both in Manchester and Lincoln. The centre of the Manchester colony appears to be stamped out. Much work will be necessary in its immediate vicinity this fall and the country surrounding it must be carefully watched next year. The Lincoln colony has been brought to such a condition that there is little danger of dissemination from it.

Nevertheless the moth is scattered through hundreds of acres of woodland there and extermination in Lincoln and the adjoining town of Weston, into which a few larvæ have been dispersed, will be costly.

The work of spraying and burning the past season has been greatly facilitated by improved apparatus prepared under the direction of Mr. E. C. Ware, of the Department, and in part invented by him.

Information about the Gypsy moth has been widely scattered through the region adjacent to the infested territory. People have learned to dread the moth and are on the watch for it. The Lincoln and Manchester colonies were discovered and reported to us by citizens. To secure still further the intelligent co-operation of citizens in this work, it is planned to distribute from house to house, within the towns immediately bordering the infested region, an illustrated bulletin descriptive of the Gypsy moth, its habits and something of its history.

In no previous year have we been able to speak so confidently of progress so early in the season. The great wooded tracts, especially in the eastern, western and northern divisions of the infested territory are now in excellent condition. More than ever this year have I been impressed with our power to cope with and in due time to utterly extirpate the Gypsy moth, when we are sufficiently supported by Legislative grants.

If the Legislature promptly provides for several years to come an appropriation strictly limited to the Gypsy moth work and equal to the amount granted this year, there can be no doubt of the final extermination of the Gypsy moth from Massachusetts.

Dr. Bethune, in commenting on the paper, said he had visited in August last the scene of operations of the Gypsy Moth Commission, and had been shewn all their appliances and methods of operation in carrying out the work of controlling and ultimately exterminating the destructive insect. He described the spraying of the foliage of tall trees with poison in order to kill the caterpillars, the scraping off and destroying egg-clusters, the burning by means of a hose discharging blazing kerosene of weeds and rubbish in rough localities which were known to be infested, and also the banding of trunks of trees with burlap. The apparatus employed was of the most perfect description and was largely the invention and product of the members of the force. He was especially impressed by the magnitude and thoroughness of the work; in traversing many miles of the State in different directions he noticed that every tree, large or small, whether in private gardens, public streets and parks, or woods and swamps, had its trunk wrapped round with burlap and a code mark painted upon it indicating the dates when it had been inspected. He felt sure that if the Commission is maintained with its present staff of workers the extermination of the insect will before many years be accomplished.

It was then moved by Mr. Dearness, seconded by Mr. J. D. Evans, and resolved: That the thanks of the Society be conveyed to Prof. Forbush for his interesting paper, and that this Society desires to place on record its admiration of the work done by the State of Massachusetts, under the able direction of Professors Fernald and Forbush, to restrain the spread of this most destructive insect, and if possible to exterminate it eventually. Had not such energetic measures been taken the consequences to neighboring States and even to our own country might by this time be appalling.

THE COTTON BOLL-WORM IN CANADIAN CORN.

By J. Dearness, London, Ont.

On the 10th of October Mr. E. T. Shaw, residing near Dorchester Station on the G. T. R., east of London, drew my attention to a larva which he said was damaging his corn by burrowing from the top downward between the rows of grain on the ear. I went over into the field—one of about four acres—and with his assistance soon obtained a number of specimens of the larva. I estimated that in the part of the field we were collecting them that about one ear in five was affected.

On taking the larvæ home I was surprised to find that it agreed exactly with the descriptions of the Cotton Boll worm (*Heliothis armiger* Hubn) and that in a Canadian latitude it could be so numerous as to possess an economic interest.

On making further inquiries I learned that the "worm" was reported in the corn-fields of most of Mr. Shaw's neighbors and indeed was said to be much more prevalent and injurious in a large corn-field of Mr. McNiven's than in Mr. Shaw's.

Last week Mr. Paul Hunter informed me that he had been husking corn in a field near Gladstone, Ont., a village in another part of the same township, and that "nearly every ear had a worm in it." He described the insect so well without any suggestions from me that I felt sure it was the same that had attracted the attention of the Dorchester Station farmers.

I visited Mr. Shaw's farm again on the 3rd instant (November) in the hope of finding some more specimens, the numbers of my first collection having been reduced by cannibalism. In confinement the larvæ seem to prefer the tissues of each other's bodies to the corn I placed in the jars with them. Possibly, indeed probably, they could not bite the rather hard shelled corn placed in one of the jars. In another jar in which two or three ends of ears of corn had been placed, when I returned after a week's absence only one specimen was living. Therefore, as just stated, I went last week to Mr. Shaw's to collect some fresh specimens to bring to this meeting. He happened that day to be hauling in unhusked corn. In the load just brought in we found relatively few affected ears, not more than one in twenty or thirty, but in the next load they were quite common, one in every two or three ears.

The affected ears usually had but a single larva in them, the largest number I saw in one ear was three. The damage done to affected ears by the burrowing and milling of the grain is not very great, less than five per cent., but some of such ears showed a mould that had made an entrance and was following the channel burrowed between the rows of the injured grains.

Dr. Fletcher informed me last night that a farmer near Orilla had reported damage to 75 per cent. of the ears of his corn by an insect which the doctor found to be the same species as the one under consideration. He will doubtless refer to it in his Notes of the Season.

The life-history of this interesting insect has been so well studied and so fully reported in the Fourth Report of the U. S. Entomological Commission and in subsequent bulletins of the Division of Entomology of the U. S. Department of Agriculture that but little remains to be done by Canadians. However its appearance here in the role above described may justify a brief synopsis of what has been recorded of its history and habits.

From the elaborate report of the Commission above cited we learn that in many parts of the Southern States the Boll-worm is regarded as more destructive to cotton than all other insects combined and that in some parts of the Southern and Western States it has been very injurious to corn. In the three years preceding the labors of the Commissioners they reported very marked damage to corn all through the South and West, it being a common experience to find fields in Virginia and southward in which almost every ear was pierced.

Glover, in 1866, wrote that a dissection of a female boll-worm moth showed that it contained about 500 eggs. Mr. F. W. Mally, who made an exhaustive study of this insect for the U. S. Division of Entomology obtained 687 eggs from one moth. The egg is oval in shape, whitish in color, and beautifully sculptured, fifty of them side by side would make a line an inch long. The eggs are laid singly on various plants, but preferably it would seem on the young silk of ears of corn. This preference is taken advantage of by the cotton growers who plant patches of corn here and there in the plantations to serve as a trap crop, the corn being harvested at a time when the planters think they will effect the maximum destruction of the larvæ. The egg hatches in 2 to 4 days. The larva which is variable in color undergoes well marked changes in its earlier moltings, some of these are noticeable in the specimens exhibited. The mature worm is an inch to an inch and a half in length and rather less than a fifth of an inch in diameter, the head is amber colored and the body is strikingly marked by a dark stripe along the back centred by a fine white line. On either side ot the dark stripe on the back are paler ones and on the side a very distinct and whitish stripe in which the spiracles are found. On the sides are three or four rows of tubercles each bearing a rather stiff hair. The two legs (the six on the anterior segment of the body) are dark in color and the prolegs have each fifteen small hooks.

The first food of the young larva is its own egg shell, but it soon settles to work devouring the tissue of its host plant, whether that be cotton, corn, tomato or some other. In August it is said to pupate in about 21 days, and the pupal stage then to extend over two or three weeks. The last brood hibernates in the pupal stage. These remarks on the life history are condensed from Mr. Mally's reports.

The perfect moth like the larva is variable in color. It is fully described and well illustrated in the 4th Report of the Entomological Commission.

The series of specimens in our collections at London were taken by Mr. Moffatt, at Hamilton, some years ago. I do not find any Ontario record of it since until this year.

Although this year it is present in sufficient numbers to warrant the attention of the economic entomologist, I do not suppose there need be much apprehension on the score of serious injury in the future. The unusually prolonged season in Ontario may have permitted the development of an additional brood as compared with other years. Were it to remain and extend its area it would be most unwelcome as the question of remedy is obviously difficult. Its presence in the green ear of corn can be detected by an observant eye. When observed the tedious remedy of pinching or hand-picking might be resorted to. Obvious difficulties stand in the way of spraying with poisonous solutions.

After the members present had examined the specimens brought by Mr. Dearness, Mr. Dwight Brainerd reported that he had met with the insect in Massachusetts this year for the first time. Mr. Winn said that a few specimens had been found in Montreal and referred to the mention of the insect in Mr. Gibson's list of moths taken at Toronto. Dr. Bethune had found it this year also at Port Hope, where the larva burrowed into the fruit of the tomato.

MUSKOKA AS A COLLECTING GROUND.

By Arthur Gibson, Toronto.

In the month of August last I had the pleasure of spending two weeks in the "Highlands of Ontario," Muskoka, my destination being Port Sydney.

Port Sydney, with a population of about 50 inhabitants, is about 138 miles due north of Toronto, being situated at the southern extremity of Mary Lake, which is about 5½ miles long and 2 or 3 wide.

To a person who has never visited Muskoka, the Lakes which abound everywhere in that district, and which as a rule, are filled with numerous small islands, beautifully arranged, so to speak, and the mainland with its wild picturesque scenery, the sight tha meets the eye is truly wonderful, and worth going some distance to see.

In Mary Lake there are seven small islands of various sizes, one probably covering an acre or even two, while another would only contain about enough room upon which to build a fair sized house. These islands for the most part are composed of solid rock, with only probably a few feet of earth on the surface. In fact throughout the whole district there is nothing but rocks, rocks, rocks. On some of the islands there is a considerable growth of trees, shrubs etc., while others seemed to be quite bare. A curious sight often observed in the Muskoka country is large trees growing out of a crevice in what appears to be solid rock. To a casual observer there is considerable mystery in this, and as I have not looked into the matter, I am unable to throw any light thereon.

Certain rocks, on the islands, as well as on the mainland, sink, as it were, straight down into the water often to a depth of 30 feet and more. These rocks are not loose, in the ordinary sense of the word, but are a part of and joined to the mainland or island as the case may be, and often reach a height of probably one hundred feet or more. It will be readily seen, therefore that even the most delightful resorts, are not always the safest, but have their treacherous surroundings, and it is a wonder more drowning accidents do not occur throughout the many lakes that make Muskoka the attractive place it is.

From an entomological point of view, Muskoka ought to offer grand inducements to the collector, as vegetation in most places is simply in the wild state, and many good captures could no doubt be recorded. The month of August, the time of the writer's visit, is too late for general work, but for the collector of Noctuidae there should be a good harvest during that month, as there are numerous good places for "sugaring" purposes. About the 1st of July, I think, would be the most profitable time to visit Muskoka, as insects generally are most to be had about that time.

However, during my vacation at Port Sydney I noticed the following species of butterflies, viz Argynnis Cybele, Atlantis, Aphrodite and Myrina, all of which seemed fairly common, with Myrina the most plentiful. The first three named were mostly worn specimens, only a few of those taken being presentable Pieris rapae, Colias Philodice and Chrysophanus Hypophlaeas were also common. The latter was the commonest of all those noticed. Everywhere this little butterfly was to be seen flitting about, and the majority of the specimens were in good condition. A few specimens of Danais archippus (Fig. 30), and Grapta progne (Fig. 35), were observed, and of the Limenitis, disippus (Fig. 36) seemed fairly plentiful, whilst but a single specimen of Arthemis came to view, no doubt owing to the lateness of the season. Besides these I noticed quite a number of specimens of Feniseca tarquinius, but could not manage to secure a single one. These interesting butterflies have a peculiar habit of flying anywhere but in the direction the collector is looking. They were all flying in close proximity to the alder bushes, on which their larvae feed upon a species of aphis.

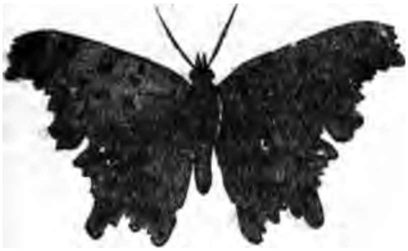


Fig. 35.

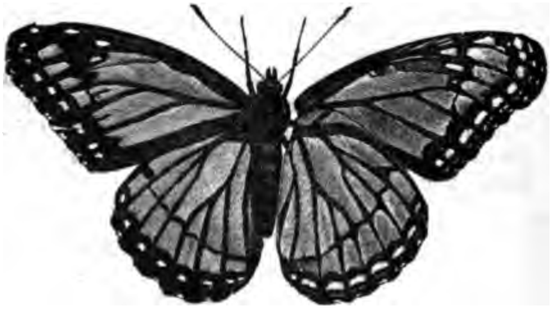


Fig. 36.

Among the moths I took Catocala relicta and concumbens, also a few other noctuids, some of which were new to me, and I noticed the wings of Euprepia caja lying upon the sand, the body of which some enemy had secured.

Besides the above, some beetles were secured with the aid of the sweep net, but as everything was burnt up with the heat, nothing much was to be done. I did not take any notice of any of the other orders, so cannot say anything about them ; grasshoppers seemed quite plentiful, however.

Dr. Wm. Brodie of Toronto, the well-known entomologist, has, I believe, visited Port Sydney on several occasions and I understand has explored the neighboring vicinity. He stopped at a farm house a few miles down the Muskoka River from Port Sydney, the owner of which is an enthusiastic naturalist, his principal hobby being ornithology. In a conversation with Mr. Crew the doctor stated that during his recent visit during the latter part of June and first week or so in July he had made some interesting captures. One specimen of Euprepia caja was secured by him as well as another moth very similar to caja and probably of the same genus. Dr. Brodie spoke of the plentifulness of Limenitis Arthemis, and reported having taken quite a number of a Chrysophanus, which I understand does not occur at Toronto, and which appeared to be very common; most of the specimens taken, however, were more or less in a damaged condition. Debis portlandia (Fig. 37) also appeared to be of common occurrence, the Dr. taking some 5 or 6 specimens. The habits of this butterfly are very similar to Neonympha Eurytris, which is our commonest representative of the "ringlets." On the whole the Doctor considered the past season to have been a poor one in the vicinity of Port Sydney, but I am satisfied that with a good season much interesting work could be accomplished there.

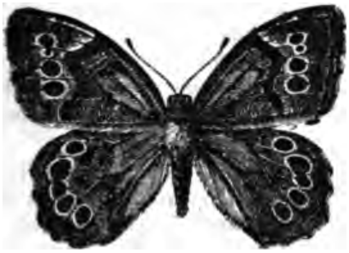


Fig. 37

The country to the north of Port Sydney and Huntsville which is about 12 miles from Port Sydney, contributes some fine specimens of insects. Mr. Tyers has received quite a large number of lepidoptera from the Muskoka region-about 25 miles north of Huntsville, among which are some very nice things in the Noctuidae, which are not included in our local fauna, and the majority of which have not, as yet, been identified.

No doubt there are new species yet to be found in that country, which has not, as far as I know, been worked up to any great extent.

RANDOM RECOLLECTIONS IN NATURAL HISTORY.

By J. Alston Moffat, London, Ont.

The aphidivorous habit of the larvæ of *Feniseca Tarquinius* has been well observed and recorded. The striking portraiture of a monkey's face in the form and markings of the chrysalid has also been commented on, and even photographed, yet no one can form a correct conception of its wonderful naturalness until they have seen it. But there is a habit of the butterfly which it at all times indulges in that I have not seen noticed in print, which is quite in keeping with the peculiarities of its previous stages, and, as far as I know, is unique. A favourite situation for this butterfly to rest on, either singly, or in groups, is the open side of a wood, or the leafy branch of a tree projecting into an open space. I have seen a single individual take its position on the extreme point of such a branch, and from there it would dart a little distance to the one side of where it had been sitting, then back to about as far on the other side of it, then back and forth a number of times before it returns to rest on its perch again. The distance it traverses in this movement may be about ten feet, and at right angles to the branch on which it had been sitting. It brings up at each end with a perfect snap, and a perceptible rustle of the wings. It seems to throw itself with great violence, and stop as suddenly, as if it had struck a board; then off to the other end of its course and back again, to and fro with such rapidity that the eye can scarcely follow it; then after a short rest it will repeat its performance.

Whether it is the male or female that indulges in this sport, I cannot say, or if it may not be confined exclusively to either sex. I had the good fortune to see the performance enacted three different times, in two of which the exhibition was brought to a fatal termination, but no attention was paid to the sex of the performers. I should be inclined to surmise that it is the male and he only.

When reading some remarks upon the parasitic worms of the genus *Gordius*, mere commonly called "Hair Snakes," from the belief entertained by many that they are horse hairs transformed in water into snakes; the writer animadverted upon the ignorance and superstition that still prevailed on this subject, which was considered not at all creditable to the superior education of the present day; which brought back to my recollection something of the tedious process by which my mind was relieved of its ignorance in this matter, and set me a-thinking that if the writer had been possessed of some further information it might have tended to moderate his estimate of himself and others; for there are few erroneous notions in natural history entertained by the multitude, that have such a reasonable excuse for their existence, in nature and in fact, as this one about "Hair Snakes." And seeing that a knowledge of facts is a more certain way of abolishing both ignorance and superstition than the denouncing of either; and as it seems to me that there are extenuating circumstances connected with this subject that are not as well known as they ought to be, I shall give an account of what I at one time saw.

When I was a small boy living in the country, which was at that time "Backwoods," and having no playmates of my own kind, I naturally sought for companionship with other kinds; passing my time in the woods and fields in search of something new, curious or attractive to me, and especially in observing the works and ways of living creatures, in which I found my chief enjoyment. On one hot summer day after heavy and continued rain I was amusing myself in a pasture field that had never been cultivated: and in which were numerous little hillocks with hollows on one side of them, indicating that there, in the long-by-past, trees had grown, been uprooted and decayed. The hollows were filled with pure water from the recent and frequent showers. Their bottoms were smooth and bright green, whilst their clear and crystalline waters reflected every passing cloud that floated over them in the brilliant sunlight. Whilst dreamingly watching the rapid passing of small white clouds reflected in one of these pools, my attention was aroused by an agitation of the water at one side; and upon examination I found a tuft of yellowish white hairs, which had evidently come from some cow's tail, partially in and partially out of the water. The hairs may have been between eight and ten inches in length, and there may have been fifteen or twenty of them together. There was about two-thirds of their length in the water, and the rest on dry ground. The part of them that was on land was a compact mass, as if they had been plucked out together and dropped there; whilst that part of them that was in the water had each individual hair as widely separated from its fellow as it possibly could get, whilst each and all of them were animated by an undulating eel-like movement which they kept up incessently, as if they were making an effort to get off and could not.

I had seen *Gordius* before that, and upon inquiry had been informed that they were "Hair Snakes," from which I inferred that they were hairs turned into snakes; and here sure enough I thought I had found a bunch of them in the process of transforming; but how one portion of a hair could become a living snake, whilst the other part still remained a dead hair, was to me a perplexing and mighty mystery, and remained so for many years afterwards. In some of my promiscuous reading I at length came upon a satisfactory solution of the enigma. It seems that there is an animalcule of some kind that breeds in water, and is in the habit of attaching itself to objects floating in the water, and if these creatures are sufficiently numerous, and the object sufficiently pliable, they can by united action produce an undulating movement, and give to the object an appearance of individual life; and this is what I had seen. Not quite an ocular delusion, but a mental deception of the most convincing kind. I had noticed when looking at the hairs, that the portion in the water appeared stouter than the other, but I satisfied myself with the thought that a living thing should grow; and in after years when I learned that an object in water appeared thicker than when out of it, I wondered if I had not been deceived in that way, but there was an apparent roughness of their surface which I could not account for, as I knew that hairs did not soften and swell in water; but what I had read explained most satisfactorily everything I had seen in connection with them.

If that tuft of hairs had been wholly in the water, and their full length endowed with motion as part of it was, each hair would have been moving independently of the others, and would likely have been scattered all over the pool; then in all probability my attention would not have been particularly attracted by them, further than to think that "Hair Snakes" were unusually numerous in that pool; and so I would have missed an instructive lesson, for what I read would not have impressed me as it did, but for what I had seen previously. This is an experiment that anyone favourably situated for obtaining the right conditions could easily carry out for themselves, and then they would have ocular proof of what a reasonable excuse there does exist for the belief that "hairs do turn into snakes."

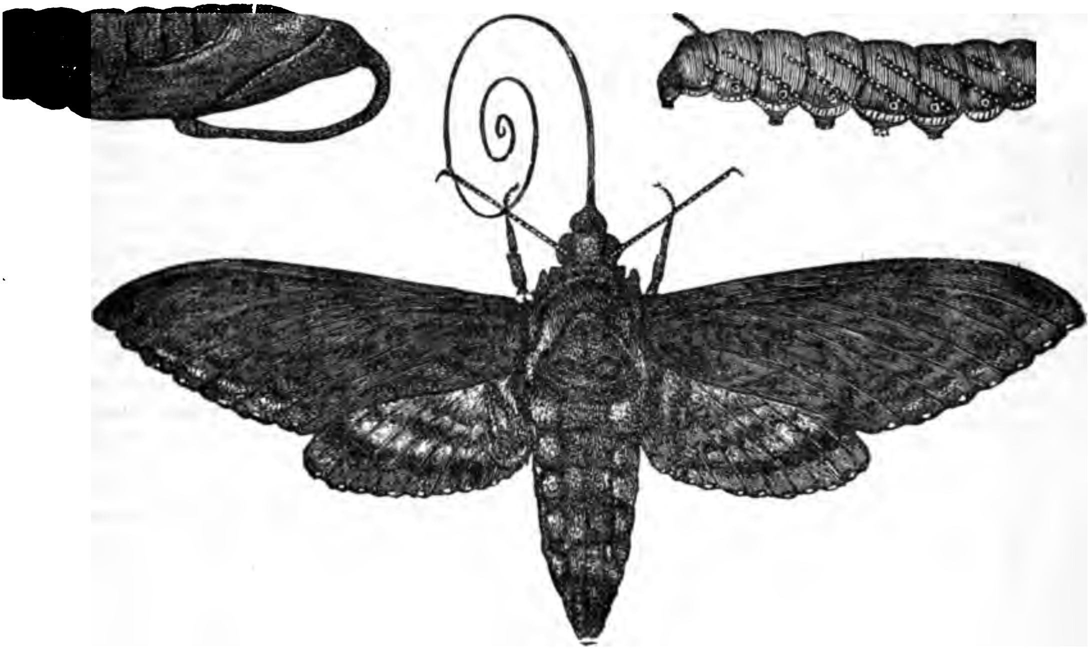


Fig. 38.

When engaged at one time in an effort to bring some chrysalids of the Tomato Sphinx (Fig. 38) to maturity, and obtain the moths, I noticed that one of them was dead, so laid it aside for a time. Upon my next handling it I found the outer skin dry and shrivelled, and upon removing a portion of it, which was an exceedingly thin and brittle scale, I saw that the moth within had been fully matured up to the point of emerging before it died, so finding that I had an excellent subject upon which to operate for discovering the position and arrangement of the various parts of the insect, as they were disposed of in the chrysalid prior to its assuming an active life, I commenced investigating. Carefully removing the outer covering, which came away as freely and as clean as if it had never been in any way attached to the corpse within, but upon which had been distinctly impressed every external feature of the coming moth, the matured pupa was disclosed scaled and coloured complete. The winglets, which were about three-quarters of an inch in length, pressed firmly—in what seems to be an unnatural position—on its breast, instead of on the sides where they are to be afterwards; and the long legs compactly gathered together under the winglets, occupying the least space possible. The external loop on the chrysalid, in which the proboscis, or sucking tube, generally called "tongue," is partly contained, interested me the most, so I gave special attention to it.

Upon removing the outer scale of the loop—which has often been compared to the handle of a pitcher, and to which it bears a striking resemblance—I found that the proboscis within was double. It leaves the head and reaches about two-thirds the length of the chrysalid in the loop, where it touches and is united to the covering of the abdomen; here it is doubled back upon itself, not sharply, but with an open curve, which produces that knob at the lower end of the handle. It then presses closely to the under, or inner side of the descending portion till it reaches the head, where it passes inward to the body of the moth, whence it proceeds downward again, under the folded legs and winglets of the moth to its full length of four and a half or five inches, tapering gradually but perceptibly from base to apex.

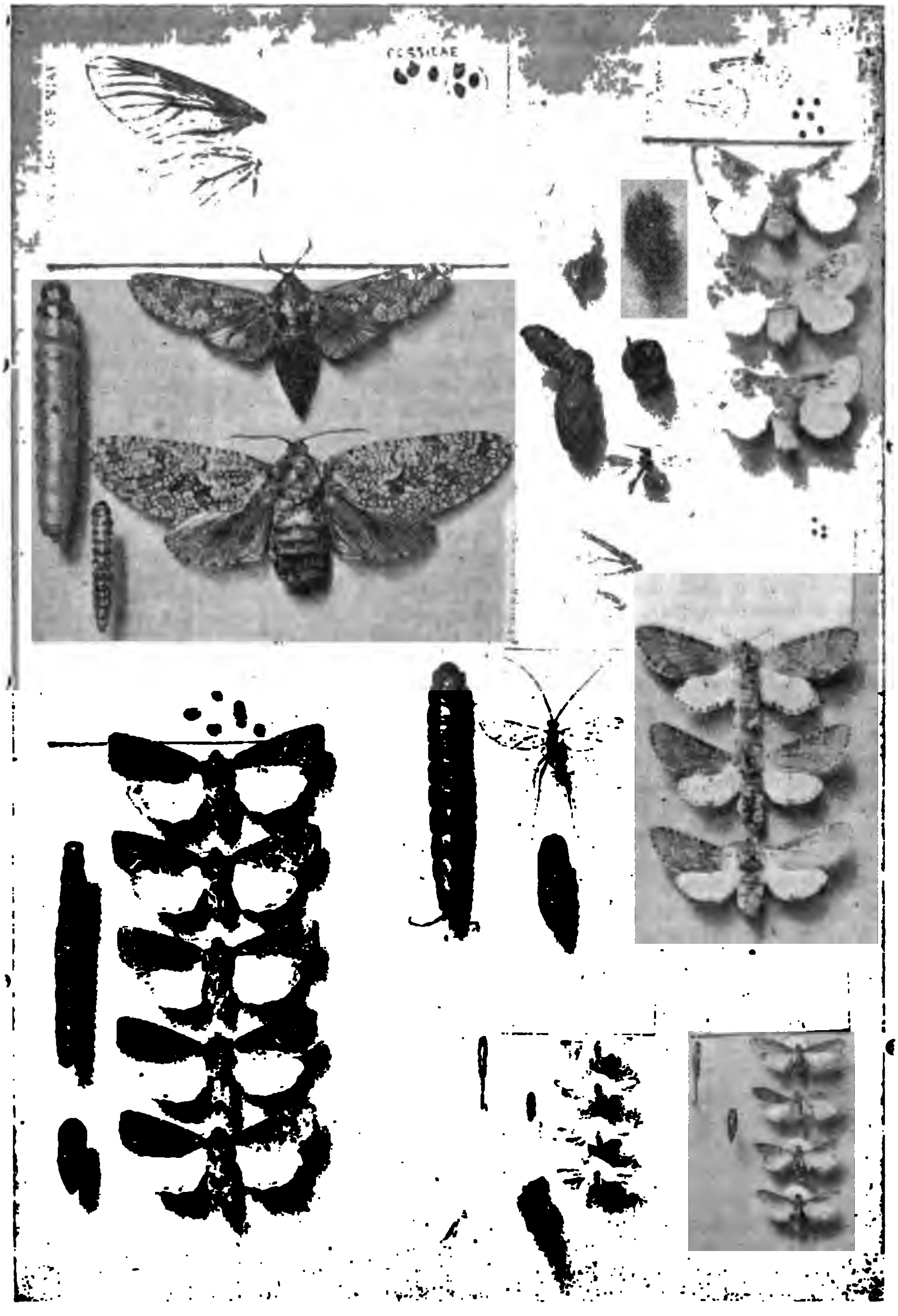
If such a chrysalid was broken open when newly transformed from the caterpillar, it would be found to be an unorganized fluid mass, seemingly held together only by the outer integuments—which parted so freely from what was inside, when matured—and upon which, even at that time, is imprinted all the external outlines of the coming moth, and from which the internal organical structure of the future solid body seems to radiate, and take on form and consistency. What a wonderful transformation is herein brought about by time and favourable conditions! From an unorganized fluid, to a diversified and complicated organism, adapted to a vigorous, active life. And the sucking tube, so delicately and yet so powerfully constructed, that the creature can extend it to its full length of five inches, or roll it up into a coil at its pleasure, not the diameter of a five cent piece. And yet more wonderful if we go back to the egg from which it all came, and within which lay "the power and the potency" for producing all that was to follow. "Never deviating from its course, but always producing a being like the parent." The proboscis is constructed of two longitudinal pieces with a groove on the inner side of each, which forms the cavity through which the moth takes its nourishment. These two pieces are firmly held together side by side by means of interlacing fibres, which yet admit of elasticity to the tube and allow the cavity to expand when food is passing through it, and may be used by muscular pressure in assisting to force it into the gullet. What wonderful adaptations of means to an end are to be observed in nature for the production of organs suited to the requirements of the creatures using them. One can at times see something like the exercise of the inventive faculty in evading or overcoming obstacles in the way of reaching the end required, when these are somewhat out of the ordinary, and with admirable success; impressing the mind with the thought that there must be somewhere, intelligent direction and supervision for the accomplishing of it.

THE PREPARATION OF SPECIMENS FOR THE EXHIBITION OF LIFE-HISTORIES IN THE CABINET.

By Dwight Brainerd, Montreal.

My brother and I arrange our cases in a rather peculiar way, and were complimented by being asked to describe it for the "Report."

The point that bothered us, was to break the lines ordinarily found in a drawer. We have four sizes of cardboard oblongs, cut proportionately, and use them instead of the common name labels. They are placed above each species, should be about half as long again as the wing span, and contain the bleached wings, frass and eggs corresponding to the name across their left hand margin. (See Plate).



Life Histories shewn in a Cabinet (D. Brainerd).

By this method, the drawers are cut up into little squares, each large enough to hold a series together with the caterpillar, ichneumons, etc. One can put a good deal of taste into the arrangement and the effect is certainly good. Outside of looks, I do not know that the system has anything to recommend it. Of course with white cards, the drawer covering must be colored: we employ a rough buff wall paper.

I am asked for some remarks on inflating and wing bleaching. Many books give instructions, but for novices it may be said that caterpillars are inflated or blown by slightly cutting the anal orifice, ventrally, squeezing everything out by the hole so made while holding them between the fingers in a soft cloth; binding a tube in this hole and drying them, inflated by a current of hot air. It is well to have a piece of blotting paper to absorb the drop or two of liquid ejected when the cut is first made, and care must be taken to clean the neck. Neglect of this makes an ugly black blotch.

Benzine is the best thing for killing, as some kinds of caterpillars seem to fatten on chloroform. The stripping and drying should be done immediately the caterpillar is dead. If not, it draws up into all sorts of knots, and if left until relaxed, is too tender. Partially dry the skin before giving it much air pressure or it will get out of shape, and stiffen up the tail end before paying much attention to the head.

I never could make much success of the straw recommended by experts, and always use a glass tube drawn to a point to furnish the air. Lap it with silk three or four times, run slightly into the caterpillar, make a turn or so in front of the last pair of legs and fasten the silk back on the tube. With very small things, this glass can afterwards be cut off by a file, and a headless pin, bent at right angles, stuck in with a drop of gum. Larger species should be slipped off by the thumb nail and pinned through the middle.

The less heat used, the better will be results. A lamp chimney fastened horizontally on a metal coat hook, makes a first class oven. And a candle is the best source of heat as by snuffing it the temperature can be regulated. The flame should be kept at least two inches below the oven, and the segments you are working held over the hottest place. Druggists sell a double bulb inflator now, which is much better than the breath for giving the empty skin its shape.

In bleaching wings, to show the veins, the only suggestion I can offer is the use of wood rather than common alcohol for washing. The oil in it increases the transparency. If bleaching has not been described in past Reports, the wings are torn or snapped off close to the body, soaked a minute in alcohol, and then, to remove the color, in Labaraque olution. When clear, wash again in alcohol, dip in water and mount on a card.

THE BROWN-TAIL MOTH (*Euproctis chrysorrhœa*, L.).

By Dr. James Fletcher, Ottawa.

The specimens of the new pest of fruit and forest trees in Massachusetts which I am able to show to-day, have been kindly supplied for this purpose by Mr. A. H. Kirkland of the Gipsy Moth Committee. They consist of the male and female moths, the egg mass, the full-grown larva and the hibernaculum in which the larvæ pass the winter.

This insect is well known in Europe and has about the same range as the Gipsy Moth. Thirty years ago, when I was a boy, it was not an uncommon species for one season at Rochester, Kent, in the south of England, but I learn that it is now rare. The first notice of its occurrence in America was when Prof. Fernald announced that he had been working on it in Massachusetts in 1897, but it had been noticed by some for four or five years before that date. It is thought to have been imported with nursery stock perhaps as early as 1885. Early last spring it was sufficiently abundant for Mr. Kirkland to point out to me several of the winter nests of the larvæ as we travelled from Boston by railway to Malden, Mass. Most of these nests seemed to be in pear trees. Prof. Fernald has published a bulletin on the subject, and also an extensive article in the proceedings of the last meeting of the Association of Economic Entomologists which was held at Boston. Both Prof. Fernald and Mr. Kirkland consider this insect as a serious pest and urge that drastic measures should be adopted to exterminate it. The latter writes under date, Oct. 5, 1898:—

"The Brown-tail Moth was not a severe pest here the past summer because of the thorough work done last winter in destroying the winter webs of the young larvæ. Where this was neglected the caterpillars proved quite a scourge and from these neglected spots no doubt the moths spread to no small degree in the flying season. The female, you will remember, flies freely. A hopeful feature is the parasite help. We found the pupae parasitised to quite an unexpected degree by *Diglochis omnivorus*, Walker, and by a few larger hymenopterous parasites. Of course, I have only two years' experience to go by, and from this as a basis no strong predictions can be made, but I should not be surprised to see this insect spread gradually over New England and become a pest of about equal rank with the Tent Caterpillar, perhaps worse. Since the female flies so well and is doubtless carried on gales of wind, I can see no prospect of exterminating the insect. While we know that the insect breeds well on many shade and forest trees, I doubt if it becomes a pest at any great distance from orchards."

Köllar, the Austrian entomologist, in his "Insects Injurious to Gardeners, Foresters, etc.," says of this insect which he treats of under the name of the Yellow-tailed Moth: "It may justly be reckoned among the most destructive insects of the orchard. The larvæ often infesting fruit trees to such a degree that not a leaf or fruit remains uninjured, as was the case in the year 1828."

The caterpillars have a very wide range of food plants including nearly all of the large and small fruits; they will also attack a great many of the common perennial plants. The favourite food seems to be the pear. Compared with the Gipsy Moth, as both the male and female moths fly easily, the Brown-tail Moth has greater powers of spreading. The life history of the species is as follows. The winter is passed by the partially grown caterpillars, which hatch in August and feed for about six weeks upon the upper surface of the leaves, stripping them of the skin and cellular tissue in the same way as is done by the Pear Slug, leaving the skeletonized leaves brown and dead. The winter shelter consists of several leaves spun together with silk, and a colony of the young caterpillars retires into this shelter in the latter part of September and remains dormant until the following spring. They revive again just as the buds are bursting and do much harm at that time, devouring the young leaves, flowers and forming fruit. When full-grown in June they spin light cocoons among the leaves, and the moths emerge about three weeks or a month later. The moths appear in July and the curious and beautiful egg masses covered with golden fur-like down may be found on the leaves during this month. They are elongated, depressed, and rounded above, more regular in outline than the egg masses of the Gipsy Moth, but like them protected by a densely felted covering consisting of the golden brown hairs from the anal tuft of the female. Not only are the caterpillars of this insect voracious feeders upon the foliage of many kinds of trees and plants; but they are also the cause of much annoyance from the stinging hairs of the larvæ and pupæ. This stinging is of much the same nature but more intense than that caused by the hairs of the species of *Halisidota*. Prof. Fernald states that many persons in the infested region suffered so severely as to require the aid of a physician and the irritation was so annoying to some of the Gipsy Moth employees that the chemist was directed to investigate the matter to discover the cause and to find out if possible an antidote. Prof. Fernald concludes his article (Bull. 17, New Series, U. S. Dep of Agriculture, Div. of Ent.) as follows. "The nettling of the skin may be caused by contact with the caterpillars, both old and young, or the cocoons, but in the latter case contact is not necessary, as the hairs from the cocoons are blown about by the wind. An English journal mentions the fact that travellers are often affected when the wind blows strongly from infested hedges along the side of the road."

By examining the specimens which I have here, it will be seen that the egg mass is about half an inch long by a quarter of an inch wide. The eggs cannot be seen under their furry covering, but they are round, of a golden color, and there are between 200 and 300 in a heap. The caterpillars vary in appearance during the different moults. The young caterpillars are described as of a dirty yellow color, with a black head and a black ring around the neck. They are thickly covered with hair and have four rows of black dots along the back. They are social in their habits throughout their larval life. From the first they spin a web over themselves, and as a leaf is destroyed another is attached to it by silken strands and gradually becomes part of the nest. The leaves attacked are also fastened securely to the twigs. The nest is never entirely forsaken; when the caterpillars get larger they sally out in search of food but return from time to time to their refuge. The mature larva (as exhibited) is rather a handsome creature, velvety black lined with brown and bearing on each segment tufts of golden brown bristles. Along each side is a conspicuous lateral interrupted white stripe with tufts of curious hair-like processes. On segments ten and eleven are spherical reddish yellow tubercles, one on each segment, similar to those found on the Gipsy Moth. These the caterpillars can elevate or depress at pleasure. The head is black mottled with brown, and the full-grown larva is nearly an inch and a half in length.

Köllar speaks of pupation taking place by preference upon damson trees, the caterpillars leaving apple and pear trees to pupate upon the damsons. He also speaks of the mode of pupation as follows: "After the last moult, which the caterpillars undergo either in the old nests under the new web or in the open air, they disperse over the different fruit trees in the garden. Pupation takes place in June; several again unite, roll some leaves together into a ball, make for themselves jointly a brownish web and become dark brown pupæ. There are from four to twelve in a ball."

Among remedies, this author recommends highly the collecting of these balls, which are generally found either on damson trees or, when these are not present, upon the lower branches of the trees which have been attacked. The Brown-tail Moth is a night flying insect which is very active at night, but sits quietly without movement during the day time. The four wings and thorax are of a snowy whiteness; the antennæ are golden brown, white above, and in the male widely pectinate. The abdomen is dark brown in both sexes, that of the female bearing at its posterior extremity a round mass of golden yellow hair, which entirely disappears by the time egg laying is completed, the component hairs having been deposited by the female over the mass of eggs as a covering.

The work which has been done in connection with the Brown-tail Moth is another instance of the grand service which is being rendered to the State, the Union and the cause of economic entomology by the Gipsy Moth Committee. The laws which have been enacted in Europe, and already in Massachusetts, show the necessity of attending to this enemy at once before it gets beyond control. It is well for the country that chance has introduced it within the area so well watched by the expert entomologists and officers of the Gipsy Moth Committee. The careful experiments which have been carried on by these gentlemen show that the destruction of the webs in winter and the spraying of trees when the caterpillars are active, supplemented with lantern traps, are effective means of keeping down the numbers of this insect, and, further, that if the matter is neglected we have in this new pest an enemy with great capabilities for spreading and doing harm, which should stimulate effort on the part of everyone living in the infested areas to do what is advised by the Committee promptly, so that, if still possible, so destructive an enemy may be prevented from spreading over a large area of country. The experience of some districts which were systematically worked by destroying the conspicuous winter shelters with the caterpillars inside them in 1897-8, is very instructive, for there were practically no moths in these districts last summer; but in adjacent places where no effort was made, the moths have increased to such an extent that these cleared districts will probably be re-infested and all the work will have to be done over again.

INJURIOUS INSECTS IN 1898.

By Dr. James Fletcher, Ottawa.

The crops of the Province during 1898 have not suffered generally from any unusual or even locally severe outbreak of injurious insects. There have been, of course, losses in all crops from the ordinary annually-recurring pest s; but the wide awake Ontario farmer now knows pretty well what to do or where to get the necessary information, when he notices an unusual abundance of an insect enemy. We may again be thankful for a season of good crops, and for the most part these were got in in good condition. The general results of the year are given concisely in the excellent Crop Reports for November, issued by the Deputy Minister of Agriculture, Prof. C. C. James. The only drawbacks of the season were exceptionally hot weather with drought in some sections in July and August and a rather wide-spread and almost unheard of frost in the month of July, which affected some tender crops. The autumn was long and fine, with no severe early frosts, thus allowing all root crops and fodder to pick up well.

Cereals.

The cereals throughout the Province have made an excellent showing. Owing to the increase in the price of wheat last autumn, a large area was sown to this staple crop. The hot, dry period referred to, although it ripened up some oats rather prematurely, produced wheat of exceptionally fine quality. Mr. W. Scott, of the McKay Milling Co'y of Ottawa, a large buyer of grain, tells me that he has not seen for many years wheat of such high quality as he has this year received from some parts of the Ottawa Valley, some samples running as high as 64½ lbs. to the bushel, without any sign of injury by the Wheat Midge or other insect enemies.

"Poor yields were exceptional, and large yields were common. The plumpness of the grain is frequently alluded to, in many cases the weight going over the standard, and as high sometimes as 63 or 64 lbs. to the bushel. Here and there only did correspondents complain of rust, midge, or other injury to the crop. The yield is 24 bushels per acre for Fall Wheat. . . . . The crop of spring wheat has been over an average in yield, and the quality is also good. The yield is 17.7 bushels per acre."—(November Crop Report, Ont. Bureau of Industries, p. 2.)

Barley yielded heavily, and the sample, for weight and color, has seldom been surpassed. I have not heard of any injury by insects.

Oats were in places light, and in some localities suffered from the attacks of the Grain Aphis, Wireworms, and Cutworms. The injury by the first of these was light. As is usually the case, the parasites which invariably accompany this plant-louse, increased in enormous numbers and the plague stopped. The parasite which did best service was *Aphidius granariaphis*, Cook.

Devastating Dart Moth. A rather bad attack of the Glassy Cutworm (*Hadena devastatrix*, Brace), Fig. 29, the caterpillar of the Devastating Dart Moth, occurred on the farm of Messrs. J. Yuill & Sons, at Carleton Place.

When insects attack a crop of grain it is always difficult to apply any remedy to the standing plants and the only resource is the practising of agricultural methods founded on the known life-history of the pest. Most insects feed upon closely allied plants; the wisdom, therefore, is apparent of following an infested crop belonging to the grass family with another consisting of plants belonging to a different botanical family.

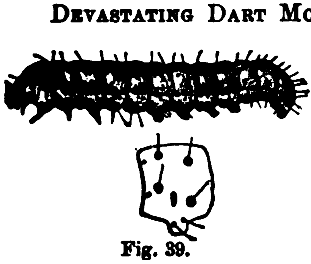


Fig. 39.

LIBRARY OF THE

Among the Cutworms, the two worst enemies of grain crops in Ontario are the species referred to above and the AMPUTATING BROCADE MOTH (*Hadena arctica*, Bois.), and although it is probable that the latter of these may feed on other plants, the favorite food plants seem to be members of the Gramineæ or true grasses, upon the roots and lower stems of which they feed in a similar manner to the Glassy Cutworm.

This Cutworm is a more troublesome pest when it attacks grain crops, from the fact that the caterpillar does not become full-fed until some time later. In an attack of this kind it is, of course, necessary to examine the caterpillars to see how nearly they are full-grown. In the case referred to above the cutworms of the Devastating Dart Moth from Carleton Place were found to be full-grown by the end of the first week in June, and the owners of the field, who wished to sow their land again to oats, were advised that this could be safely done. The land was cultivated at once, and on the 8th of June was seeded down again to oats and grass. This crop was not attacked at all because the caterpillars were all in the chrysalis condition. This would not have been the case if the infesting Cutworms had been the caterpillars of the Amputating Brocade Moth.

Even less amenable to remedial treatment than the above are the various species of WIREWORMS (Fig. 40), which attack grain crops particularly on timothy sod. No satisfactory remedy for these has as yet been discovered. Sowing rye or barley on infested land has been found useful by some, and late ploughing is highly recommended; but no applications to the land or poisoning of the seed are of any avail.

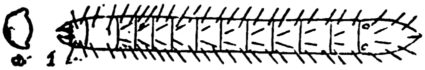


Fig. 40.

An interesting discovery has been made during the past summer at Toronto, by Mr. C. W. Nash, and at Norwood, Ont., by Mr. T. W. Wilkins, of a parasitic fungus belonging to the genus *Cordyceps*, which was in both places destroying the wireworms in considerable numbers. This fungus was much more slender than the one which is frequently figured as the parasite of the White Grubs (*Cordyceps melolonthæ*, Tulasne) (Fig. 41). So far, the identity of the wireworm destroying species has not been obtained. It is probable that it is an undescribed species.

THE WHEAT MIDGE (*Diplosis tritici*, Kirby), which a few years ago worked such havoc in the wheat crop, seems almost to have disappeared from Canada; however, one district seems to have suffered severely from this pest last season. This was along the shore of Lake Ontario in the Niagara peninsula. Another pest, which did not appear at all in 1898, is the American Frit Fly (*Oscinis carbonaria*, Loew.), which in 1890 injured wheat very much in the eastern portions of the Province. For three years before that it had also been an enemy of meadow grasses.

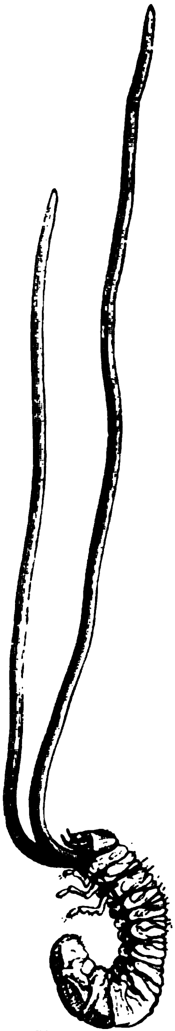


Fig. 41.

THE WHEAT-STEM MAGGOT (*Meromyza Americana*, Fitch), although present in most localities where looked for, seems lately to have gone back to a large extent to its natural food plants, the wild native grasses.

The most important attacks upon wheat, and these were by no means extensive or severe, were by the old and well-known culprits, the Hessian Fly (*Cecidomyia destructor*, Say) and the Joint-worm (*Isosoma tritici*, Riley).

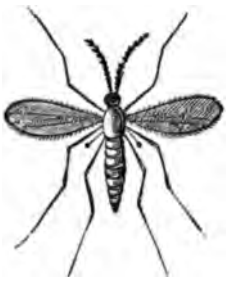


Fig. 42.

The Hessian Fly (Fig. 42—greatly magnified) is probably more prevalent than it is generally thought; but as its depredations in most places are not serious they are not observed. The injuries to fall wheat in the autumn are greater than by the more conspicuous attack on the stem during the summer by the spring brood. Occasionally the spring brood attacks the wheat plants in the succulent root shoots just as is done by the autumn brood; this would be due I think to a late spring holding back the development of the wheat plants, The eggs would be laid on the leaves, and the young maggots might attack the shoots too severely to allow of them developing into stems. It has been frequently noticed that insects are not belated to the same extent as plants by cool spring weather,

The Wheat Joint-worm (*Isosoma tritici*, Fitch). (Fig. 43—the fly highly magnified). In 1895 specimens of injured wheat straws bearing many galls in the bases of the sheathing leaves of the stems were sent from Meaford, on the Georgian Bay, by Mr. Thomas Harris; these were considered to be *Isosoma hordei*, Harris. The injury to the infested crop amounted to 5 per cent. There was no recurrence of the attack last year at that place; but a somewhat similar attack upon wheat appeared at Verdun, Bruce Co., on the opposite side of the peninsula. Many specimens were sent to me by Mr. William Welsh, both in the autumn of 1897 and last spring. The galls were different from the Meaford specimens in that there was little swelling, and the cells of the larvæ were almost entirely in the tissues of the stem proper, short sections of which were rendered hard, woody, and brittle by the operations of the insects. From some of these stems a large number of the flies were reared. These have been identified by Dr. L. O. Howard and prove to be *Isosoma tritici* of Fitch. The injury was serious, attacked stems producing fewer and smaller grains than the others. From the Verdun material, in addition to the gall makers, two kinds of parasites were reared, *Homoporus chalcidiphagus*, Walsh, and *Eupelmus epicaste*, Walsh; but these were not present in sufficient numbers to affect the outbreak to any appreciable degree. During the past summer loss from this Joint-worm was not so great as in 1897, so it is to be hoped that its natural enemies may have increased. The eggs of the joint-worms are inserted into the young green straws in June by the female flies. Wheat, oats, rye and barley are damaged. There is only one brood in the year, a few of the flies issuing in the autumn, but most of them not till the following spring. Most of the galls are situated in the first or second joints of the stem above the root, and, as the normal time of emergence is in the spring, any treatment of the stubble such as burning over or ploughing down deeply, by which the insects are destroyed or smothered, must reduce their numbers considerably. Mr. Welsh noticed that many of the hardened portions of the stems were broken from the straw in threshing and were found among the rubbish or in the grain. These pieces from half an inch to one inch in length contain from five to ten larvæ. This shows that, besides treating the stubble, these pieces of stem as well as the straw must also be attended to. The broken-off hardened pieces should be collected at threshing and cleaning and burned. Likewise straw from fields where the joint-worms have been found should be destroyed by either feeding or some other means before the time at which the flies should appear.

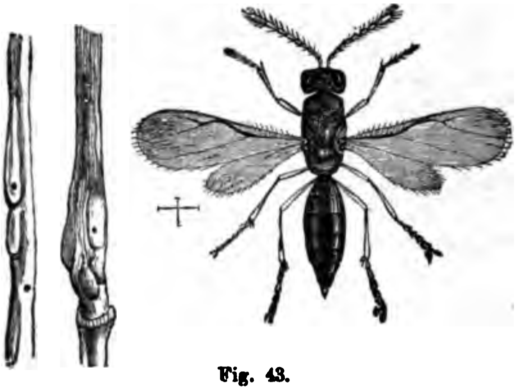


Fig. 43.

The Pea Weevil (*Bruchus pisorum*, L.). As in previous years many inquiries have come in for the best means to kill the "pea bug" in seed pease. The life-history is well-known; the eggs are laid on the young green pods; the grub on hatching eats its way in and penetrates one of the forming pease. There it remains until full-grown, consuming the interior of the pea and passing through all its stages from a white fleshy grub to the chrysalis and then to the perfect beetle. A small proportion of the beetles emerge the same autumn and pass the winter under rubbish or in barns and other building. The larger number, however, remain in the pease and do not emerge until the next spring, so that they are frequently sown with the seed. The perfect insects fly easily and resort to the pea fields about the time the blossoms appear. They feed for some time on the flowers and leaves, and egg-laying takes place as soon as the pods are formed.

Remedies.—The best remedy for this insect is, undoubtedly, to treat the seed with bisulphide of carbon. Nearly all the large seed houses have special buildings for this purpose, and few seed pease are sold which have not been treated. Should it be found, however, when sowing pease, that they contain living weevils, it is an easy matter to treat them. Perhaps the most convenient way for farmers is to take an ordinary 45-gallon coal oil barrel. Into this 5 bushels of pease may be put at one time. According to the quantity of seed to be treated, use 1 ounce of bisulphide to every 100 pounds of pease; therefore, if the barrel is filled. put 3 ozs. of the chemical in a flat, open saucer or basin on the top, or pour it right on the pease; cover up the top quickly with a damp sack or other cloth and put some boards over that. Bisulphide of carbon is a colourless liquid which volatilizes readily at ordinary temperatures; the vapour which is quite invisible, but has a strong, unpleasant odour, is heavier than air, therefore sinks readily and permeates the contents of any closed receptacle. This liquid is very inflammable; so great care must be taken with it. The pease should be treated under a shed out of doors, and should be kept tightly closed up for 48 hours. No light of any kind must be brought near, or an explosion may occur.

The late sowing of pease is sometimes practised to avoid the weevil; but this plan is not approved of, as the crop is small and is then frequently attacked by mildew.

Seed pease may be held over without injury for two years, and this is a sure remedy against the Pea Weevil; for the beetles must emerge the first spring, and if the pease are tied up in paper or cotton bags, as they cannot eat through these materials, they will all be dead before the second spring. Weevilled pease should not be used as seed, as they produce, if they grow at all, weak, spindly plants.

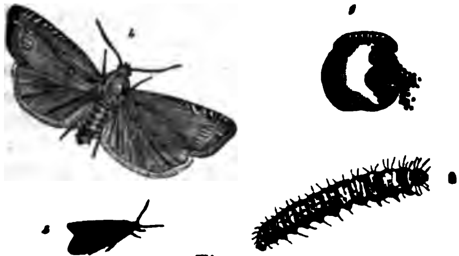


Fig. 44.

The Pea Moth (*Semasia nigricana*, Steph., Fig. 44). For many years pease in all parts of Eastern Canada have been much injured and sometimes rendered quite unfit for the table by the caterpillars of a small moth. The large, late garden pease have suffered most. Although its injuries were so considerable, it was only last year that the moth was reared and its identity determined. Maggoty pease are well known to the housekeeper; but it is only at intervals of some years that they are abundant enough to cause much complaint. The caterpillars are whitish and fleshy, with dark heads and some dark tubercles on the segments, from each side of which a slender bristle springs. When full-grown they are about ¼ inch in length; they then eat their way out by a small round hole through the pod and enter the ground a short distance, where they spin small oval cocoons in which they pass the winter, and the perfect moths do not appear again until nearly the middle of the following July. Dr. J. Ritzema Bos, in his Agricultural Zoology, says of the same or a closely allied European species: "The moths fly about in large numbers around the pea blossoms, always a short time after sunset. The females lay one, two, or at most three, eggs on a very young pod. In fourteen days the caterpillar is hatched, bores into the pod, and attacks the pease. The pease attacked are covered, while in the pod, with the coarse-grained excrement of the caterpillar and are often united, two or three together, by a web." The perfect moth is a modest-coloured but pretty species, ¼ inch long when the wings are closed, mouse-coloured, bronzed towards the tips of the wings, silvery gray beneath. The only markings are along the front costa and at the apex of the fore-wings. The costal marks consist of 10 or 12 short, black streaks separated by similar clear white dashes; near the apex is a flask-shaped mark which bears 4 or 5 short, longitudinal, black dashes. Last year the attacks of the Pea Moth upon pease in Ontario were considerable, Mr. John McMillan, M.P for Huron, even putting the loss at one-third of the crop in his district.

Remedy—As a remedy, deep ploughing has been recommended. It has also been found that early sowing and the cultivation of early varieties enable the pease to mature before the moths are on the wing. The perfect insects have been reared both in 1897 and last season. In the former year all the specimens emerged between July 12 and 15, and in 1898 between July 13 and 15. These specimens were kept under natural conditions, and these dates probably agree with the time the moths appear naturally in the field.

THE BEAN WEEVIL (*Bruchus obtectus*, Say, Fig. 45). From time to time notices appear in reports of entomologists and in the newspapers in the United States of injury to seed beans by a weevil similar to the Pea Weevil, but rather smaller. This is the Bean Weevil, a small, very active beetle, at one time thought to be a native of America but now considered to be a cosmopolitan species, which has been imported into this country through commerce. Authentic instances of this pest having occurred in Canada in injurious numbers have not, I believe, been recorded until this year, when it was found at Strathroy, Middlesex Co. As in the case of the Pea Weevil, the Bean Weevil occurs in the seed and is sown with it. The eggs are laid on young forming pods and the grubs eat their way inside and attack the seeds. There is, however, one important difference in the life history, namely, the bean weevils are able to propagate in the dry, stored seed, and two or three broods may come to maturity and entirely destroy the beans, whereas in the case of the Pea Weevil the young grub can only begin life in the soft, green pease; again, there is never more than one weevil in a pea, while in the case of the Bean Weevil, ten, twelve, or more, may occur in a single bean, according to its size.

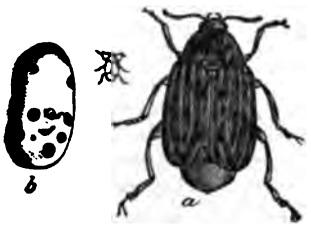


Fig. 45.

Remedy.—The remedy for this new enemy of the bean is precisely the same as for the Pea Weevil, viz., to fumigate the infested seed with bisulphide of carbon. If, however, it is found that the beans have been badly bored before the injury is detected, it is far better to destroy the whole by burning and procure new seed without going to the trouble and expense of fumigating.

FODDER CROPS AND ROOTS.

Fodder crops of most kinds have been remarkably heavy in most parts of the Province during the past season. In the Ottawa Valley such crops of clover have never before been seen, and with the exception of a little injury by the Black Army-worm, *Noctua fennica*, Tausch. in the spring, both crops were exceptionally heavy and were saved in the best of condition. In the west one or two occurrences of the Clover weevil (*Phytonomus punctatus*, Fab.) were mentioned but no appreciable effect upon the crop was made.

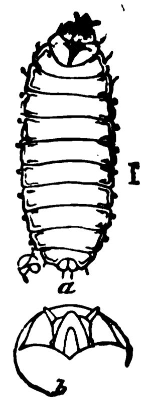


Fig. 46.

THE CLOVER-SEED MIDGE (*Cecidomyia leguminicola*, (Lintner) did a good deal of harm in the seed growing districts and some farmers speak of turning their attention to the Mammoth Red Clover and Alsike, because these varieties are not injured by this troublesome insect. The remedy of feeding off or mowing the crop before the 20th June has been found satisfactory by those who have tried it, because the maggots (Fig. 46) of the first brood mature and leave the clover heads to enter the ground and complete their changes soon after the date given, and if the clover is fed or cured before that date the larvæ are destroyed If left later the maggots leave the clover heads and produce the second brood which matures just as the second crop, from which the seed is reaped, comes into flower. About the time the seed is ripe these leave the clover and pass the winter in the ground, to emerge again the following spring just at the time the clover blossoms.

The hay crop has been little injured by grasshoppers or other pests. In old worn out meadows "Silver top," caused by leaf-hoppers and other sucking insects, has been noticed; but well worked land with a good rotation of crops suffers little from this injury.

Potatoes have been less attacked by the COLORADO POTATO-BEETLE than usual. Early in the season some correspondents thought that this pest was dying out, but the hot weather of midsummer soon brought it up to its usual abundance. The well tried remedy, Paris green, in either wet or dry applications, is now too well known to require more than a reference.

Injuries by White Grubs and Wireworms were more serious than is often the case, and unfortunately little can be done to counteract their operations.

THE CUCUMBER FLEA-BEETLE, Fig. 47, (*Crepidodera cucumeris*, Harr.) which frequently does great damage to potatoes by perforating the leaves, has been successfully treated again this year by spraying the plants with Bordeaux mixture and Paris green made with the formula 6 lbs. of copper sulphate, 4 lbs. of fresh lime and 45 gallons of water, to which ½ lb, of Paris green is added. This remedy is now becoming well known, and on account of its usefulness widely used by our wide awake farmers to prevent the loss which is still enormous from the ravages of the Potato-rot. The first spraying should be done in Ontario not later than the 1st August, and this should be followed by two more applications on 15th August and 1st September. These sprayings also, of course, render unnecessary the treatment of the potatoes for the Colorado Potato-beetle, as those insects are killed at the same time.

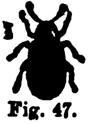


Fig. 47.

A rather unusual injury to potatoes was this year reported from Carrville, York Co., by Mr. J. Lahmer. This was by the FOUR-LINED LEAF-BUG (*Pœcilocassus lineatus*, Fab.), and occurred at the end of May. The attack was, however, restricted in area and did not continue late into the season. The life-history of this pest has been worked out by Prof. Slingerland, of Cornell University. The eggs are laid in the terminal twigs of currant and other bushes in the autumn and do not hatch until the following spring. The bugs attack the leaves of the currant and some other shrubs to a certain extent, but are more injurious to various herbaceous perennials. The plants most often noticed as injured by this insect are Sage, Mint, Gooseberry, Currant, Dahlias, and the Japanese Honey-suckle (*Weigelia*), Potatoes and some other plants less frequently. It is hardly likely that this insect will ever prove a serious enemy of the potato crop. The mature insect is a bright greenish yellow bug three-tenths of an inch in length, with two black spots on the thorax and four stripes of the same color down the back. It is very quick in its movements.

Remedies.—As the eggs are laid in the twigs of bushes and are comparatively conspicuous, owing to the white tips protruding, wherever the bugs have been troublesome the eggs should be looked for and destroyed during the winter. The bugs and larvæ can be killed or driven away by dusting with pyrethrum insect powder, or by spraying with kerosene emulsion or whale-oil soap solution.

THE TURNIP APHIS or CABBAGE APHIS (*Aphis brassicæ*, L.). Turnips in many sections have been badly injured by this plant-louse, which has been one of the worst enemies of root crops during the past season. Although much loss is due to this pest every year, as a rule, nothing is done by farmers to remedy the evil, many volunteering the information that nothing can be done. This, however, is not the case, for successful experiments have shown that, by spraying the plants bearing the first colonies which appear early in August, much may be done to protect a crop. At the time of thinning and hoeing turnips the colonies are small and may be easily treated by means of a knapsack sprayer with kerosene emulsion (one part to nine of water), or with whale-oil soap, one pound in eight gallons of water; or even by hoeing out the infested turnips and covering them with soil, an easy matter at that time with the hoe in hand.

VEGETABLES.

Vegetables in gardens suffered locally from the usual pests of the garden, Cutworms, Flea-beetles, Onion, Radish and Cabbage maggots. For cutworms, banding freshly set out plants with paper or tin collars was quite effective; and for plants grown in rows, bran poisoned with Paris green was most effectual, either slightly dampened so as to make the poison adhere and then distributed in small heaps along the rows, or with more bran added until it was almost dry and then drilled along the rows. Flea-beetles (*Phyllotreta vittata*, Fab.) on radishes, young cabbages and turnips were speedily disposed of by dusting the plants with Paris green, 1℔. in 25℔s. of perfectly dry land plaster. The ROOT MAGGOTS were unusually abundant and many experiments were tried to find a good remedy. Dusting Hellebore and Insect powder well down among the plants gave perhaps the best results with radishes and onions. For the cabbage maggot Hellebore 2 oz and Kainit 2 oz. were mixed in a pailful of water; about half a teacupful poured around the root of each cabbage after pulling away some of the earth, gave considerable protection but was not a perfect remedy. Kainit used alone, dissolved in water, or applied dry close to the roots of cabbages, onions and radishes and then covered with soil, or dusted on the surface close to the roots, had the effect of protecting the plants for a time, but did not give with me results sufficiently good to allow of its being recommended in the way some American growers have done. Last season, however, was an exceptionally bad one for all of the root maggots; radishes, onions and cabbages all being attacked severely from early in the spring until right up to the hard frosts of autumn. Kainit however is a quick acting fertilizer and a decided insecticide. Further experiments have been planned, and growers of vegetables can use it with advantage in ordinary years.

THE CARROT RUST-FLY (*Psila rosæ*, Fab.). An attack upon carrots which has recently called for attention in Canada is by the European enemy of the carrot, called the Carrot Rust-fly. This has come under my notice occasionally during the last ten years in parts of Ontario, Quebec and New Brunswick, in all cases doing much harm in restricted localities, but as a rule disappearing after a year or two. The outbreaks, however, are, I fear, becoming gradually more numerous. During the past autumn infested carrots were sent to me from Knowlton and Beauce in Quebec Province and from Ottawa in Ontario. The attack is easily recognized. Early in the season the leaves of young carrots turn reddish and the roots will be found to be blotched with rusty patches, particularly towards the tip These carrots when stored for winter use, although sometimes not showing much injury on the outside, may be found to be perforated in every direction by dirty brown burrows, in which are many semi-transparent yellowish maggots about ¼ of an inch long. These maggots are blunt at the tail end, but taper toward the head, where is a black hooked tip, forked at the base, by which the maggot makes its way through the roots. The pumparium is reddish-brown, and the maggots, as a rule, leave the carrots before assuming this form. The fly and its work are shown very well in the figure (Fig. 48) by John Curtis, which I am able to present herewith through the courtesy of Miss Ormerod and Messrs. Blackie & Sons. The mature fly is two-winged, ¼ of an inch long, bright shiny black, with yellow legs and red eyes. The wings are beautifully iridescent. The winter is passed either as a maggot or in the puparium.

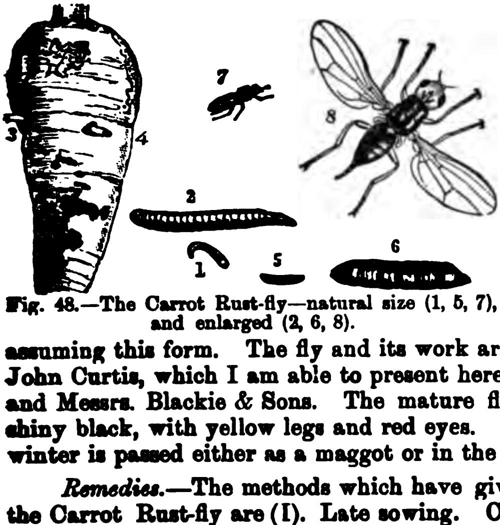


Fig. 48.—The Carrot Rust-fly—natural size (1, 5, 7), and enlarged (2, 6, 8).

Remedies.—The methods which have given the best results in preventing injury by the Carrot Rust-fly are (I). Late sowing. Carrots which have been sown late have been found much freer from attack than those sown at the ordinary time. When grown as a field crop it is usual to sow carrots as soon as possible, but for table use carrots of excellent quality may be obtained from seeding as late even as the middle of June. If field carrots grown for stock are only moderately attacked they can be fed but, of course, are not as good as sound roots. (II.) Preventive remedies consist of applications of strong smelling substances by which the characteristic odor of the carrots is masked. For this purpose, sand tainted with coal oil or carbolic acid, has been used to good effect. Kerosene emulsion diluted 1 to 10 and sprayed along the drills by means of a knapsack sprayer, also gave comparative immunity. In localities where the fly is known to have occurred, the ordinary precaution of sowing carrots as far as possible from the infested land will occur to all growers. Where carrots have been stored away during the winter in sand or earth, this soil should be treated to destroy the pupæ, which leave the roots and enter it to pass their pupal stage. A convenient method is to put the soil into a wet manure pit, or, if this cannot be done, it might be buried in a deep hole, specially dug for the purpose, and, after covering up, the top soil should be firmly tramped down.

THE CORN-WORM (*Heliothis armiger*, Hbn.). Several correspondents have complained of the unusual abundance this autumn of the caterpillars of what Prof. Lugger calls the Sweet-Corn Moth or Tassel Worm. These are both good names, but the insect is far more generally known as the Corn-worm. It is also the same as the notorious Boll Worm of the cotton, to which crop it frequently does great damage. Unfortunately, no very good, practical remedy has been discovered for application in the cotton field. The injuries of the Corn-worm are in Canada almost confined to the fruit of tomatoes and to sweet corn, particularly the late varieties. Late in October, Mr. C. L. Stephens, the Secretary of the Orillia Horticultural Society, sent specimens of the caterpillars and injured ears of corn, with the information that the caterpillars had been very destructive, injuring as much as 95 per cent. of the ears of both sweet corn and yellow field corn. It was a new outbreak in the locality, and was the cause of considerable anxiety. Specimens were sent also from Sombra (Lambton Co., Ont.), and two rather bad occurrences came under my notice at Ottawa. The caterpillars do not appear until late in the season. In the month of October they were found of all sizes eating the young grains of corn, mostly near the tips of the ears. There were sometimes five or six caterpillars in a single ear, many of which were rendered quite unfit for the table. As the larvæ approached full growth, they would occasionally eat their way out of one ear by a neat round hole and travel to another ear. They were very variable in color, from 1¼ to 1½ inches in length, of a pale-greenish or dark-brown color, marked with longitudinal dark stripes and with a conspicuous stigmatal band, white mottled with pink, the body bears the ordinary tubercles, which are distinct and black, each one supporting a slender bristle. The whole upper surface is marbled with white and the whole surface velvety, by reason of numberless and very short bristles, black and white in about equal numbers. When full grown, these caterpillars eat their way out of the ears and, entering the soil, spin cocoons, within which they change to chestnut-brown pupæ. This moth is by no means a common species in Canada, and all the specimens I have seen have been taken late in the year. Prof. Lugger states that the insect does not winter in Minnesota, but that all are killed late in the fall. This, he points out, would mean that the insect has to be re-introduced every summer from the South, where it can successfully hibernate. Whether this is also the case in Canada, I am not sure, but I think that some must with us pass the winter as pupæ. The moth, like the caterpillar, is very variable in color. It is usually of a pale, dull, ochreous yellow, with variable olive or ruddy markings on the forewings. The yellowish hind wings have a broad black band and are edged with pink. These moths expand a little more than an inch and a half. The caterpillars of the Corn Worm feed, besides, upon a great many other kinds of plants than those mentioned, such as pumpkins, tobacco, beans, peas and a large number of weeds and garden plants.

Remedies.—The only remedy which can be suggested is the hand-picking of the caterpillars. The destruction of the moths by lantern traps has been also recommended: these consisting of a lamp standing in an open pan containing water and a little coal oil. These traps are placed at night in fields where the caterpillars have been abundant. When an ear of corn is attacked, the silk shows the effect of the injury going on beneath the husks by being discolored prematurely. As soon as this is noticed, the leaves of the husk should be pulled back and the marauders destroyed. Fall ploughing will, doubtless, break up the cocoons and expose many of the pupæ to various enemies.

FRUIT CROPS.

Notwithstanding several adverse circumstances, the fruit crop of the Province was a good one, and satisfactory profits were realized. If the crop was short in one section it was abundantly made up somewhere else. "Notwithstanding all disadvantages, the returns from all over the Province, with the exception of a few northerly counties, show that the supply of fruit, more especially apples, was considerably more than sufficient for home consumption, very large shipments having been made to England and the United States from the western fruit growing section. Pears, peaches, plums and smaller fruits were also shipped from many localities." (*November Crop Report.*)

Insect enemies were the cause of much loss; but most convincing evidence was again given this year of the value of spraying, and undoubtedly one of the most instructive and interesting exhibits at the Toronto Industrial Fair was the display of fruit gathered from sprayed and unsprayed trees in the same orchard. These orchards were those in which Mr. W. M. Orr, the Provincial Superintendent of Spraying Experiments, had carried on his work during the summer of 1898, and were situated in twenty-four different localities. There were in all 250 plates of fruit. The owners of the orchards were in no way interested in trying to prove that spraying was or was not beneficial, but were practical men anxious only to know how to get the largest returns of money from their property. They would, therefore, be the very people to acknowledge poor results. The superintendent had nothing to do with the selection of the actual fruit shown, and did not see it until it arrived in Toronto, where he took charge of it and displayed it to good effect as a most convincing proof of the efficiency of spraying. At the last meeting of the Ontario Fruit Growers' Association at St. Catharines on December 2nd, 1898, Mr. Orr read his report on the results of the experimental spraying work carried on for the Ontario Government under his direction during the year. This is a most valuable document, and will be published in full in the Report of the Fruit Growers' Association. Mr. Orr explains his method of work and gives extracts from the letters of some of the owners of the orchards. In estimating the percentage of perfect apples, a part of the tree was picked clean and the fruit carefully examined; every specimen that had a worm or a spot, no matter how small, being rejected as imperfect. Some of the facts given and the figures which substantiate them will certainly convince many that spraying does most decidedly pay. The spraying must, however, be done properly, without stint of labour or materials, with the best obtainable apparatus and at the proper time. I am more and more convinced that failure to protect crops by spraying is due to lack of skill or carelessness in applying the spray, disregard as to the exact date when the successive applications should be made and misdirected economy as to the pump and nozzle used. Occasionally, good, careful fruit-growers find that spraying does not always give the results which they expect; Mr. Orr, however, says, "The owners of every orchard in which we worked this year, with one exception,—Mr. Curwen, of Goderich—report that the Codling Moth was largely controlled by spraying."

I give the following quotation from Prof. L. H. Bailey's recent pamphlet, "Impressions of Our Fruit-growing Industries," because it bears directly on this point, he says: "Does spraying pay? The past season has given strange results in spraying; in very many instances spraying seemed to do no good. Does spraying pay, then? Certainly, the same as tillage and pruning do. We do not know why there were so many unsatisfactory experiences in 1898, but this does not lessen the fact that bugs and fungi should be killed. That spraying pays is as well demonstrated as it is that apple worms, tent caterpillars and potato blight are injurious. Markets often fail, but it does not follow that markets are a nuisance. The surest way is to make it a rule to spray everything every year." (*Cornell Bulletin 153*, 1898.)

In summing up the results of the spraying work of the season, Mr. Orr said at St. Catharines: "It appears from results obtained in experimental work that from 65 p.c. to 80 p.c. of perfect fruit can be secured when spraying is regularly and properly done, and when the conditions are favourable, such as an orchard standing high and dry on well-drained land, away from buildings or hedgerows, and the trees planted far enough apart so that the limbs do not come within 10 or 12 feet of touching, and have an abundance of sunshine and free circulation of air. It is also important that the trees be properly trimmed, all rubbish removed, and the land properly fertilized, for it is a fact that two-thirds of the orchards in Ontario are starving. With good apples at the price they have commanded this year and last, the orchard, if properly attended to, would be the most profitable part of the farm."

If the fruit-growers of Ontario, generally, can be made to appreciate the above statement of Mr. Orr, who is a practical fruit-grower, and will follow his advice, enormous advantage must accrue to the country from the good work which the Provincial Minister of Agriculture, the Hon. John Dryden, has done by having the spraying experiments and other work on injurious insects carried out. In fact, it is hard to find in the whole Provincial expenditure anything which has given such manifest and quick returns for the small amount of money expended. The great interest which was taken in this work of spraying is shown by the fact that over 3,500 fruit-growers attended the meetings when the spraying was being done, in order to see the work, to ask questions and to learn the the proper way to carry on operations for themselves. This was almost double the number that attended two years ago.

Spraying with arsenical poisons, such as Paris green, London purple, arsenate of lead, etc., was done, first of all, to lessen injury by the Codling Moth on the apple, and by the Plum Curculio on plums and cherries; but it is now used against all foliage eating insects. It has lately also become the custom to spray many plants with a combined mixture which will destroy both insect and fungous pests. For this purpose, the best mixture known is Bordeaux mixture and Paris green. The formula most widely adopted is one which is very easy to remember, as all its parts contain the figure 4. It consists of copper sulphate, 4 lbs., quick lime, 4 lbs., Paris green, 4 ozs., water 44 gallons.

Owing to the large amount of capital necessarily invested in and required to operate a fruit farm, and the permanent nature of fruit plantations, more attention has been given to those causes upon which failure and success depend than has been the case with ordinary farm crops, which change from year to year; consequently, more perhaps is known and more enquiries are received with regard to orchard pests than any other class of insects. The common enemies which occur year by year in orchards have been treated of over and over again in our annual reports, and there would be no advantage in speaking of them now at any length, but attention may be drawn to some of the more serious or unusual outbreaks.

TENT CATERPILLARS have been even more abundant than last year in almost every province of the Dominion. In the Ottawa district groves of basswoods, maples, and aspens were stripped of every vestige of foliage, as well as the underbrush, consisting of numerous kinds of shrubs. Although the Forest Tent Caterpillar was slightly more numerous, the American Tent Caterpillar (Fig. 49), it was noticed, occurred with it in almost equal numbers, and, notwithstanding that close search was made for parasites, in this district at any rate, few were found. A large number of egg clusters were collected to see if the young caterpillars contained in the egg were in a healthy condition. These were kept in a warm office, and by the 1st of Januaryhundreds of young caterpillars had hatched and were gathered together in a large mat-like cluster on the side of the jar.

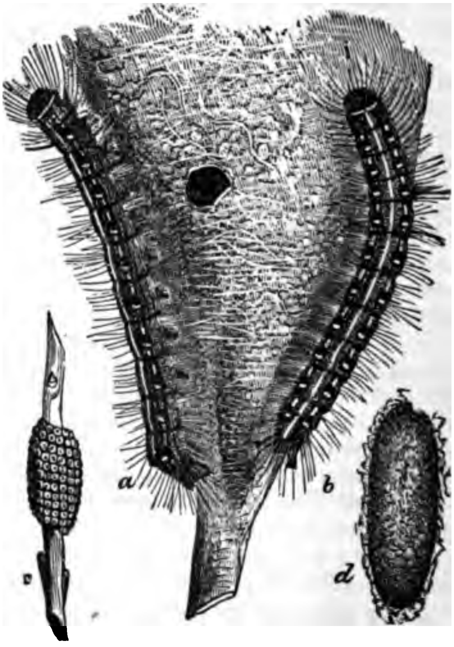


Fig. 49.

There is no indication of the presence of either egg parasites or fungous disease, and as the trees throughout this district bear enormous numbers of the egg clusters, the outlook is ominous; special effort must be put forth by fruit growers and gardeners during the present winter and next spring, or there will certainly be serious loss next season. The remedies which give the best results against these insects are (I.) the collection and burning of the egg cluster during the winter, (II.) the cutting off and burning of the nests of young caterpillars early in spring, when they may be easily detected by the conspicuous white tents which they spin in the crotches of branches, and (III.) the spraying with Paris green of all trees liable to be invaded in an infested district. The sooner the application is made the more effective it will be, for many insects which can be controlled while young are much more difficult to poison after they have reached a certain size.

THE APPLE APHIS (*Aphis mali*, Fab.) appeared in large numbers early in spring, and many enquiries were received about it from the western part of the Province. Little harm, however, was done either in the spring or late in the autumn; when most of the damage due to this insect generally occurs.

THE PLUM APHIS (*Aphis prunifolii*, Fitch) was less abundant by far than last year, although reported from a few places. Specimens of another plum aphis, (*Hyalopterus pruni*, Fab.,) were received from one or two Ontario localities.

THE BLACK CHERRY-TREE APHIS (*Myzus cerasi*, Fab.) was certainly less wide-spread in the Niagara district last season than in 1897, and reports concerning it were very contradictory; nevertheless considerable damage was done, particularly in orchards of sweet cherries. It has been noticed that the dark-coloured plant-lice are more difficult to kill than the green ones. Of several remedies which have been tried, the one which has given the best results is whale-oil soap solution, one pound of Good's Caustic Potash Soap No. 3 in six gallons of water, applied warm as a spray. Kerosene emulsion, also an excellent remedy, must be used as strong as one part to six of water for these plant-lice. The eggs of the Black Cherry-tree Aphis are laid upon the twigs, particularly on the fruit spurs, by the last autumn brood. There is no doubt, therefore, that good work could be done by spraying the trees during the winter, or better still, early in spring before the buds burst.

Another enemy of the cherry, as well as of the plum and pear, which when neglected did much harm was THE CHERRY AND PEAR SLUG (*Eriocampa cerasi*, Peck). The remedy which gives the surest relief is the prompt spraying of the trees with Paris green, one pound in 200 gallons of water, adding in all cases an equal amount of fresh lime with the arsenical poison, Paris green, to counteract its caustic effects on the foliage.

THE GREEN FRUIT-WORMS.—The caterpillars of three very similar moths belonging to the family *Xylina* did much injury to apples and pears, attacking specially the young fruit. These caterpillars are not regular pests of the orchard, but appear in numbers at long intervals; but, as they have a special taste for the green fruit, attacking it in preference to the foliage on fruit trees, the damage they do is much more important than that done by many other injurious insects. In addition to fruit trees they attack maple trees. At Niagara and at Aylmer, Que, near Ottawa, shade and forest trees, particularly the Silver Maple *Acer dasycarpum*, Ehrh.), were terribly disfigured and almost defoliated by these caterpillars over large areas. It was pleasing to see at the end of June that thousands of them were being destroyed by various insect-eating birds, chiefly warblers, but especially by the English Sparrow. In the streets of Niagara they were so vigorously assailed by the sparrows in the branches, and by chickens which waited for them below, that few could have escaped to complete their changes. Mr. Orr writes of the occurrence of this pest in the Niagara peninsula:—"The Green Fruit-worm, a comparatively new comer, and but little known here, is likely to become a serious pest: some growers reporting from 20 to 30 per cent. of their apples and pears ruined by it. By the middle of June it had destroyed much fruit."

Mr. N. H. Cowdry also writes of its depredations on the fruit of apples and pears at Waterford, Ont. The same complaint came from Mr. J. A. Link, of Sombra, Ontario.

Remedy.—The only remedy is early spraying, while the caterpillars are small and while they are feeding on the buds and young foliage. Luckily for the fruit grower these caterpillars are always accompanied when in large numbers by parasitic enemies.

The Rose Beetle (*Macrodactylus subspinosus*, Fab.), Fig. 50.—This well-known enemy of the fruit grower, which every year does so much harm by eating the flowers of grapes, apples, pears, roses, plums, raspberries, blackberries, and in fact all plants belonging to the Rose family, as well as many other kinds of trees, did some harm this year in the hotter western sections of the Province. It occurred in large numbers near Niagara upon the young fruit of apples, in some cases actually covering the fruit. There is only one brood of this pest, the mature beetles last for about five weeks. There is perhaps no fruit insect known more difficult to combat than this is. The ordinary insecticides have little effect on it. Covering rose bushes with netting and beating the beetles from the bushes into pans containing coal oil can be practised on a small scale. The only remedy which so far has been found at all effective on a large scale "is to spray grape vines and fruit trees with a wash made by adding three or four pecks of freshly slaked lime and a quart of crude carbolic acid to 50 gallons of water." Dr. C. M. Weed.)

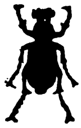


Fig. 50.

The Raspberry Sawfly (*Monophadnus rubi*, Harris), was more than usually abundant in the western counties of the Province, but where promptly sprayed with Paris green and water, and later when the fruit was forming with white hellebore, was easily disposed of.

Scale-insects.—The advent of the San José Scale in Ontario had a remarkable awakening effect on the fruit growers of the province, and, as a consequence, there has been during the past season far more enquiry with regard to injurious insects than has ever been the case in a single year before. The vigorous policy of the provincial Government and the excellent conscientious work done by the Inspector, Mr. George E. Fisher, and his assistants, backed up by a rigorous application by the Federal Government of the San Jose Scale Act has undoubtedly had a good effect not only among the thinking fruit growers of the Dominion, but upon statesmen in other countries who have made several enquiries as to what steps were being taken in Canada to stamp out this most injurious insect and prevent further importations from infested countries. Having had ample opportunity of examining the districts which were infested, I can bear testimony to the great success which has attended these efforts. The investigations in connection with the San Jose Scale have brought to light other scale insects where their presence was not suspected; both the Forbes Scale and the Putnam Scale have been found to be widely distributed, but in very few instances have they occurred in injurious numbers. These two scales are of particular interest owing to their very close superficial resemblance to the San Jose Scale; the microscopic difference of structure, however, can at once be discovered when the scale-insects are taken from their scales and after proper preparation examined under the miscroscope. In addition, both of these species lay eggs at certain times of the year, while the San Jose Scale, it is alleged, never does so. The Forbes Scale (*Aspidiotus Forbesi*, Jnsn.) and the Putnam Scale, (*A. ancylus*, Put.) can be successfully combated by spraying the trees with whale-oil soap, one pound in two gallons of water. The best time to make the application is early in spring before the trees are covered with foliage.

The Scurfy Bark-louse (*Chionaspis furfurus*, Fitch.), Fig. 51., wide-spread, but not very abundant nor injurious has been found in many localities in the western part of the province, and, like the the very injurious Oyster-shell Bark-louse, can be destroyed with the whale-oil soap solution mentioned above, followed by high culture and good horticultural treatment of the trees.

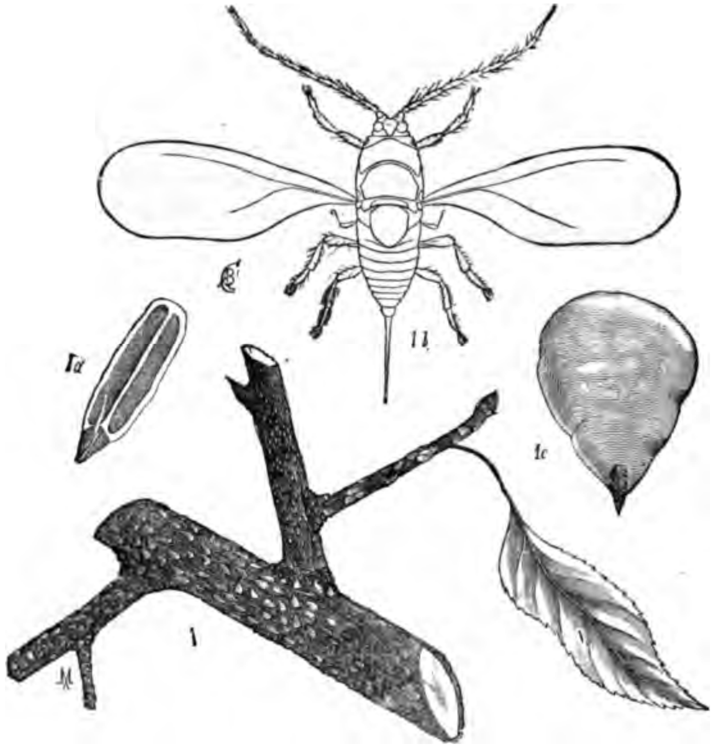


Fig. 51.

NOTES ON INSECTS OF THE YEAR DIVISION NO. I., OTTAWA DISTRICT.

By W. Hague Harrington, Ottawa.

The first insect to attract attention in the spring was the larva of the little Arctian *Phragmatobia rubricosa*, Har., the fuscous little woolly bears of which may be found scurrying over the snow in day time or coiled up in some small depression where they had rested from their wanderings of the day before. On bright days in April, *Aphodius prodromus*, Brahm, filled the air. This species has only been noticed at Ottawa for the last four or five years, but is now as common as *Aphodius inquinatus*, Hbst.

Cutworms.—The Black Armyworm (*Noctua fennica*, Tausch.) was abundant in some localities as near Hull, Quebec, and on the Central Experimental Farm, attacking many plants, but especially clover and peas in fields, and also doing much harm in gardens as a cutworm. This is an early developing species which is full-fed about the end of May, and consequently plays great havoc in beds of young seedlings of early vegetables, sometimes cutting off as many as six or eight peas, or mowing down eight or ten inches along a row of onions or carrots in a night. Occurring with this caterpillar, as cutworms in gardens, were the larvæ of the White Cutworm (*Carneades scandens*, Riley), uncommon at Ottawa, and our commonest cutworm. The Red-backed Cutworm (*Carneades ochrogaster*, Gn.). These caused considerable loss in gardens among young vegetables and seedlings of flowers. This latter is also a large species when full-grown; but as the eggs laid the previous autumn do not hatch till the following spring the caterpillars do not become full-fed till much later in the season than the Black Armyworm and the White cutworm, both of which pass the winter half-grown. For some reason the White Cutworm did not revive from hibernation last year till much later than many ther cutworms. Poisoning with traps made of bundles of weeds, grass, or clover dipped in a strong mixture of Paris green and water, or with poisoned bran, were very successful. Cabbages, tomatoes, and other young plants were easily protected at the time of setting out with rings of paper or tin.

THE CODLING MOTH (*Carpocapsa pomonella*, L.) was unusually prevalent and injurious in unsprayed orchards. The standard spray for this insect is the poisoned Bordeaux mixture, with which not only the fungous disease "Black Spot of the Apple" is treated, but all foliage-eating insects, as well as the Codling Moth. The formula is copper sulphate 4 lbs., fresh lime 4 lbs., water 40 to 44 gallons, and Paris green 4 ozs.

TENT CATERPILLARS.—The most remarkable occurrence of the season was of the two common species of Tent Caterpillars *Clisiocampa americana*, Harr. (Fig. 49) and *C. disstria*, Hbn. (Fig. 52). These two kinds of caterpillars which were about equally abundant, stripped bare many acres of Aspen Poplar, Basswood and Maple groves along both banks of the Ottawa River and along the Canadian Pacific and Canada Atlantic Railways in the counties of Carleton.

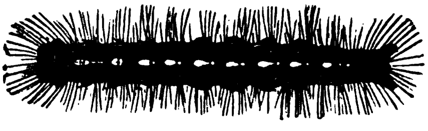


Fig. 52.

THE ASH-GRAY PINION.—Maples were also extensively injured at Aylmer, Que., and at Hull, Que., by the green caterpillars of *Xylina Grotei*, Riley, and *X. antennata*, Walker. These caterpillars are known as Green Fruit Worms, on account of their destructive habit of eating large holes in the sides of young apples and pears. In the Ottawa district they did little harm in orchards, but stripped almost bare large forest trees at the two places mentioned. This is an uncommon attack which has not occurred in anything like the severity of last season since 1885. The ashy-gray moths do not appear until late in the season. There are three species very similar in general appearance. All of these may be taken at sugar in the Ottawa District in September and October.

The caterpillar of the Eye-spotted Bud-moth (*Tmetocera ocellana*, Schif), Fig. 53, was rather common on apple trees in company with the Oblique-banded Leaf-roller (*Cacœcia rosaceana*, Harr), Fig. 54. The Cherry Web-worm (*Cacœcia cerasivorana*, Fitch), Fig. 55, was extremely abundant on the wild bird cherries on the Laurentian mountains, near Chelsea, Que., the unsightly webs attracting attention along the sides of the mountain road. Although so abundant on the wild cherries, this insect did no harm to cultivated varieties.

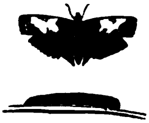


Fig. 53.

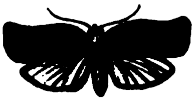


Fig. 54.

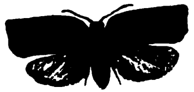


Fig. 55.

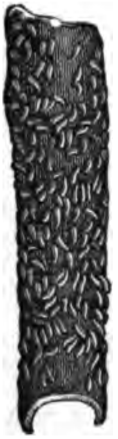


Fig. 56.

THE OYSTER SHELL BARK LOUSE.—(*Mytilaspis pomorum*, Bouche), Fig. 56, is very common and destructive in this district, occurring not only on apple trees but also on many other kinds of shrubs and trees in the garden and forest. It was noted as injuriously abundant on red and black currants, lilac, spiræas, ash, dogwood (*Cornus*), mountain ash and hawthorne. The Forbes scale was found on the fragrant currant (*Ribes aureum*, Pursh), and the Putnam scale on the elm.

The White Cedar Lecanium (*Lecanium Fletcheri*, ckl.) and "Red Spiders did some harm to cedar hedges.

Canker worms were noticeably less abundant than usual, but the Basswood Looper (*Hybernia tiliaria*, Harr), Fig. 57, was very common, the delicate male moths drawing the notice of the least observant by their clumsy flight and the late season at which they appear.

THE CURRANT SAW FLY (*Nematus ribesii*, Scop), was as usual abundant and destructive where the bushes were not treated with the well-known remedies, Paris green or White hellebore.

The Currant Aphis (*Aphis ribis*, L.) was the most destructive insect on currants and gooseberries this season, many bushes being so much injured that they dropped their leaves and the fruit was ruined.

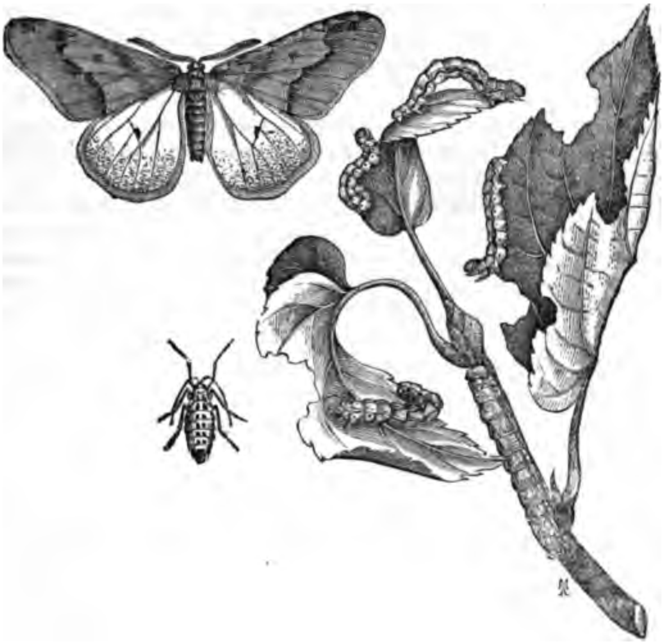


Fig. 57.

The Grapevine Leaf-hoppers (*Erythroneura* species) did much harm to Virginian creepers and grapevines, but particularly to the former. These insects, like the grapevine, flea-beetle (*Haltica chalybea*, Illiger), seem to prefer the Virginian creeper to the grape. This is sometimes very apparent where the creeper and wild grapevine are trained together over arbours.

Two more enemies of the Virginian creeper not often referred to as such, but which both occurred in some numbers this season at Ottawa in the same arbour, were *Saperda puncticollis*, Say, a beautiful longicorn, velvety black with golden yellow stripes down the edges of the wing cases and with spots on the thorax. These emerged from the larger living stems of Virginian creeper, while from younger stems many specimens of *Psenocerus supernotatus*, Say, were reared.

The Mourning Cloak Butterfly (*Vanessa antiopa*, L.) and the Interrogation Butterfly (*Grapta interrogationis*, Fab) were destructively abundant on elms planted as shade trees. The caterpillars of the former also stripped large branches on willow bushes.

Root Maggots in cabbages, radishes, turnips and onions were remarkably destructive right through the season.

Two injurious insects which it was hoped had "run their course" and which for the last year or two had not been nearly so abundant as in previous years, this year again showed up in decidedly increased numbers. These were the imported Larch Saw fly (*Nematus erichsonii*, Hartig) and the Cattle Horn fly (*Hæmatobia serrata* Rob-Desv). For the Horn fly perhaps the most convenient remedy is 1 lb, of pine tar mixed with 10 lbs. lard. A small quantity of this ointment rubbed lightly along the back and sides of cattle once a week during the fly season will have the effect of keeping flies away and will also have a healing and soothing effect upon any sores due to rubbing or licking.

NOTES ON INSECTS OF THE YEAR, DIVISION NO. 2, BAY OF QUINTE DISTRICT.

By J. D. Evans, Trenton, Ont.

Throughout this district the only crop which has suffered to any extent from insect foes during the past season (1898) is the seed pea crop.

For a number of years the cultivation of fancy or seed pease in this section for foreign markets has been very extensive, while a good demand and high prices ruled for such, extra precautions were taken by growers to have the weevil (*Bruchus pisorum*) killed by the seedsmen before they arrived at maturity or had destroyed the pease; but during the past three or four years, when prices have become lower, ordinary grades of pease have been grown to a greater extent than formerly and the grower becoming careless in housing and dilatory in marketing his crop, the weevil has greatly increased in numbers. This occurs not so much along the Lake front of the County of Prince Edward as in inland sections. While many farms may be entirely free from the pest, others will lose from 15 to 30 per cent., while instances occur, although rarely, in which the loss is 40 per cent.

Another destructive agency to the pea crop is a blight said to be caused by a fungous growth which oftentimes will utterly destroy a whole field in a single night. This disease has been very prevalent during the past season and has caused a great loss to the farming community.

NOTES ON INSECTS OF THE YEAR, DIVISION NO. 4, NIAGARA DISTRICT.

By A. H. Kilman, Ridgeway, Ont.

The past season has not been marked by any great insect depredations, at least as far as my personal observation and inquiry have reached, in this locality—Niagara District—but variations in the occurrence of insect pests, pointing either to an increase or a decrease or in the more startling direction of the approach of new foes, is always of interest to students of Entomology and to farmers and fruit growers.

Contary to expectation, the Northern Army-worm, *Leucania unipuncta*, was less in evidence than during 1896-7. In late August, when the imagines of this insect are nearly always to be found, none were observed. The grass-hopper, (*Caloptenus femur-rubrum*) was also conspicuously absent.

Cabbage butter-flies *Pieris rapae*) during the drought in the earlier part of the season, were scarce but late cabbages were much injured by the larvæ of this insect. Similar observations were made in regard to the Colorado potato-beetle. Early potatoes were not materially injured and unwary gardeners, deceived by the non-appearance of the slugs, relaxed their efforts and paid the penalty by seeing the plants of the later crop "sailing under bare poles."

Raspberry canes have been seriously injured in some localities, by a cane borer, probably *Oberea bimaculata*.

An inconspicuous green worm, doubtless the Raspberry Saw Fly (*Selandria rubi*, Harris), operated in spots all over the fruit section, completely destroying some patches of red-raspberries near Niagara Falls.

Neglected vineyards on sandy soil suffered an entire loss of crop from the ravages of the Rose Beetle (*Macrodactylus subspinosus*, Fabr.)

In this locality plums failed to blossom. The Curculio (*Conotrachelus nenuphar*), attacked the later cherries with the result that the fruit was wormy and useless.

Apples, especially in neglected and unthrifty orchards, were scarred by insects and fungi and wormy by larvæ of Codling moth.

The Tussock Moth (*Orgyia leucostigma*) is on the increase here. In the neighboring city of Buffalo, it has become a scourge, defoliating the horse-chestnut trees, and attacking other trees as well. To gather and destroy the cocoons or egg masses in winter seems to be the most feasible method of checking the ravages of this insect.

The birch trees in the parks are attacked by a new pest, an Agrilus. The species will be determined next summer.

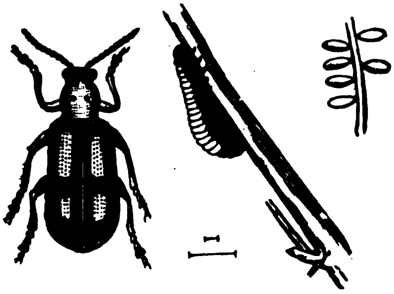


Fig. 58.

Crioceris asparagi, Linn., the Asparagus Beetle, (Fig. 58) which according to Dr. A. S. Packard, is not a native but an introduced species has advanced in its attack upon asparagus plants as far north as Niagara River. Mr. Reinecke informs me that he has found the beetles in abundance on asparagus at Buffalo.

The Punctured Clover-leaf Weevil, *Phytonomus punctatus*, Fabr., in August last, appeared in great numbers on the side-walks and fences and on the shores of Lake Erie, but though I have repeatedly examined the clover fields for the purpose of determining the amount of injury done by this particular insect, thus far I have failed to find either the imago or the larvæ on a clover plant.

NOTES ON INSECTS OF THE YEAR.—DIVISION No. 5, LONDON DISTRICT

By R. W. Rennie, London, Ont.

In submitting my report as director for Division No. 5 for 1898, I am very glad to state that there have been no additions to the number of injurious insects in this district, with two exceptions; in fact there has been a falling off in numbers of older pests that in previous years played great havoc with certain crops.

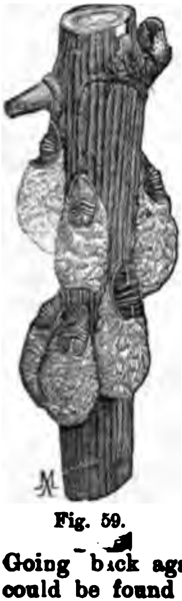


Fig. 59.

One exception is the Cottony Maple scale (*Pulvinaria innumerabilis*, Rathvon)—Fig. 59—which appeared in very large numbers this last spring; in fact, in such large numbers did they appear that on one of the finest streets in this city (London), the trees appeared to have been sprayed with whitewash.

In the fifth report of the U. S. Entomological Commission, there is an article copied from Prof. Riley's report as U. S. Entomologist for 1884, page 412, in which he states that the females, before the falling of the leaves, migrate to the branches and twigs, and there fix themselves, generally on the underside. Such has not been the case in this city. They were found occasionally on the branches and twigs, but the vast majority were noticed round the spot where a branch had been cut or broken off; indeed, so thickly that they almost overlapped each other. They have not confined their attacks to the maple, but have also been working on the grape vine.

It has apparently been quite a study to find out in what manner this spreads. Some think that it is due to planting infested trees, others by birds, insects, water, etc., but if you were to get a colony under the microscope you will soon find out how they spread.

I have a table three feet in diameter on which I use the microscope. One evening I placed a colony on a glass slip under the microscope, which was at one edge of the table, and probably examined them for ten or fifteen minutes, and there left them. Going back again in about twenty minutes, there were none on the slip, but they could be found at the extreme edge of the table. They do not seem to care what they walk over, anything and everything is the same to them. How many reached the floor I do not know, but from the number left on the table fully two-thirds had got away. Take any insect as small as this is that will walk over three feet in the course of twenty minutes, or less. Surely there can be no doubt as to how they spread, particularly when they do not care what they walk over.

As to the means proposed for destroying this pest, they are various, such as heading in of the branches. (What is the good of this if they do not confine themselves to the branches ?) Also spraying with whale oil soap this may be effective, but it is also very expensive. In my own opinion there is nothing better than kerosene emulsion, which I think is one of the best destroyers of insect life that can be used without excessive expense. There are also parasitic enemies, as there are in every other branch of animal life.

About the 24th of May last I noticed a small larva feeding on the eggs, but was unable to identify it in this stage Mr. Balkwill, the treasurer of our Society, succeeded in rearing a few, which were identified by Mr. J. Alston Moffat as Hyperapsis signata.

The other exception is *Graptodera chalybea* (Fig. 60), commonly known as the grape vine flea beetle. This insect appeared in great numbers this spring in this locality, although this is not a grape-growing district. This insect passes the winter in a mature state, attacks the buds of the vine as soon as they begin to grow, destroying both fruit and foliage at once. In about three or four weeks the mature insects disappear, but their place is taken by a small, insignificant looking larva, generally black in colour, which very soon makes its presence known by eating holes through the leaf, making the leaves look like sieves ; not eating like some larvæ do, starting at one part and continuing until the whole leaf is devoured. They move from place to place on the leaf, apparently selecting parts in the leaf that are most acceptable to the palate of an epicure (as such they undoubtedly are.)

These larvæ attain their full growth about the end of July, pupate in the earth, and emerge in from ten days to two weeks in the mature state. The greatest injury is done in the spring by the mature insect.

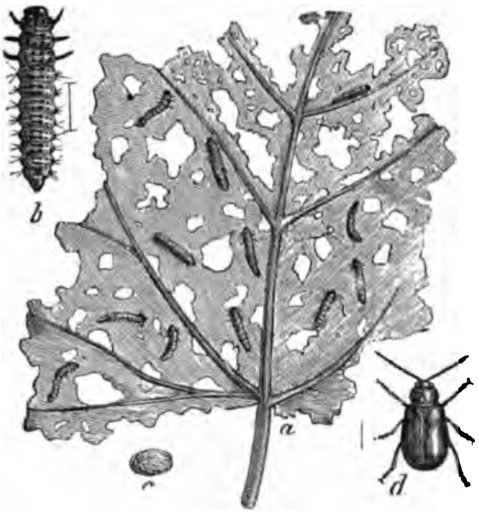


Fig. 60.

The most effective remedies for this insect are: To remove all fallen leaves in the fall, and whatever other decaying vegetable matter has accumulated around the vines, and burn it ; also in early spring to syringe the vines with a weak mixture of Paris green and water. Hellebore may be used in the summer against the larvæ.

In regard to other destructive insects, as I mentioned in the first part of my report, they have been less numerous than usual.

After remarks had been made by many of those present on the abundance or rarity during the past season of many familiar insects, the following resolution was moved and unanimously adopted :—

"That a most cordial vote of thanks be tendered to the members of the Montreal Branch for the exceedingly generous reception they have given to the Entomological Society of Ontario on the occasion of their annual meeting."

FEW OF THE MOST TROUBLESOME INSECTS OF THE PAST SEASON (1898).

AD BEFORE THE COLLEGE OFFICERS' LITERARY AND SCIENTIFIC SOCIETY, BY H. L. HUTT, B.S.A., ONT. AGRICULTURAL COLLEGE. GUELPH, ONT.

As far back as I can remember, I have always taken a great deal of pleasure in dying insect life. On more than one occasion can I remember being punished and graced in school, for investigating the jumping capabilities of a grasshopper, or squeez- an involuntary song from a captive cicada. But that was in days gone by. Now the licy of the Educational Department is to encourage the study of such subjects as were en discouraged by hard knocks.

At this institution Entomology has probably always been a part of the regular urse. When I began to study it systematically about ten years ago, under the direc- n of Prof. Panton, it appealed to me at once as one of the most interesting and prac- al subjects on the curriculum. And the first summer I spent at home after leaving e College, all the available beehives, boxes and glass-topped section cases were con- rted into breeding cages, where all transformations could be watched in the specimens thin. My collection that year was not confined to insects alone, but it contained a riety of creatures from batrachians and lepidopterous larvæ to milksnakes and their gs. And I might add that one of the most interesting methods of studying this most teresting subject is to watch the transformation and habits of the insects themselves, her in confinement, or as they occur in nature.

As there is no class of society that is exempt from the losses and annoyance caused insects, a knowledge of their life history and habits is important to all, but to none it of greater importance than to the farmer and fruit-grower.

During the past summer I received a great many letters enquiring about insects fecting a wide range of crops. To deal fully with all mentioned would necessitate writ- g a book, but as the subject of this paper I have taken a few of the more common ones at have been the most troublesome, and these, it will be noted, represent fairly well st of the orders into which insects are usually divided.

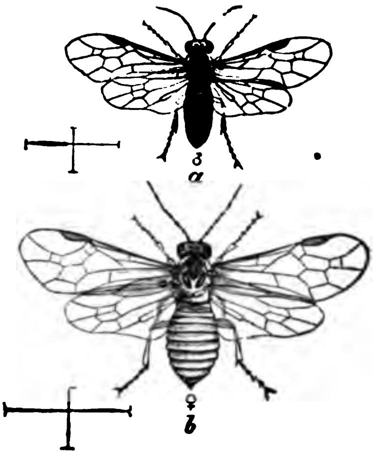


Fig. 61.

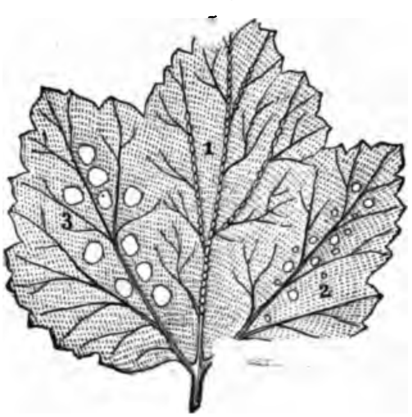


Fig. 62.

1. THE CURRANT SAW-FLY, (*Nemátus ribésii*). One of the earliest insects to make appearance was the Currant Saw-Fly (Fig. 61, *a* the male, *b* the female). This belongs the Hymenoptera, or membrane winged insects, and is closely related to that most dustrious and beneficial of all insects—the honey-bee.

It passes the winter usually in the pupa state, in a slight papery cocoon spun neath the surface of the ground or under rubbish or leaves. From its winter quarters it emerges early in the spring, about the time of the opening of the buds of the currant and gooseberry. Last spring they appeared in unusual numbers, and during the warm parts of the day might be seen in swarms about the bushes.

In appearance this saw-fly is a little smaller than the common house-fly, and has a yellow body. The male is considerably smaller than the female and is somewhat darker in color. During bright, warm days they are very active, but early in the morning or when the weather is cool and cloudy they are sluggish and may be easily captured.

Saw-flies are so called because of the saw-like ovipositors of the females. Speaking of these, Prof. Comstock says, "This is at least one instance of where the female wielding of a saw is done most skilfully, for the female saw-fly uses these nice tools in a very efficient manner, to make slits in the leaves and stems of plants in which she places her eggs." The eggs are deposited, from 20 to 40 in number, upon the back of the ribs and veins of the leaf, usually upon the lower leaves of the bushes (Fig. 62) They hatch in about ten days and the young larvæ begin to feed at once upon the tender leaves. They grow rapidly, and if unchecked will in a short time entirely strip the bushes of foliage. In the course of about three weeks, the larvæ become full grown (see Fig. 10), when they leave the bushes, spin small papery cocoons, and enter the pupa or resting state. From these the adult saw-flies emerge in a short time, and a second brood of larvæ follow, which strip the bushes again the latter part of summer.

This is probably one of the easiest insects to hold in check, as it feeds upon bushes that are easily got at, and it is readily destroyed by stomach poisons, such as Paris green or hellebore. The most important points in fighting it are to begin early, as the young larvæ are usually well at work by the time the leaves are full grown, and to force the spray up from the under side of the bushes so that it will reach the lower leaves where the caterpillars begin operations.

2. THE LARCH SAW-FLY (*Nemátus Erichsonii*). On the 24th of June last, my attention was directed to the scorched appearance of the foliage on the clump of European larches in the field in front of the College. Upon going to examine them closely, I found that they had been almost entirely stripped of their needles by some kind of insect. Upon further investigation I found one or two small trees on the west side of the clump upon which a few of the larvæ were still at work. It was a smooth, glaucous green worm which I had never seen before, but from certain characteristics, such as the seven pairs of prolegs and the curling under of the last segments of the body, I recognized it at once as the larva of some species of saw-fly. Upon consulting Packard's excellent report on "Forest Insects" I found it fully described as the Larch Saw-fly (*Nematus Erichsonii*), a new and much-dreaded enemy in the larch and tamarack forests.

Like the Currant Saw-fly, it is supposed to have been imported from Europe. The first notice of it on this continent was in 1881 by Dr. Hagen upon specimens found in Massachusetts. Two or three years later it was found in vast numbers in Maine, New Hampshire and other New England States, where it had stripped all the tamarack forests. In the report of the Ontario Entomological Society for 1885, Prof. Fletcher of Ottawa gives an excellent account of its life history, and of the devastation it had made in the tamarack swamps of Quebec and the Maritime Provinces.

It was then noted that the most western point that it had at that time reached was about Casselman, on the Canada Atlantic, about 30 miles east of Ottawa. Its appearance at Guelph last June would indicate that it had made considerable progress westward. In my travels over the Province last summer, I was particular to watch for indications of its presence, and I noticed from the scorched appearance of the tree tops, that it had stripped the tamaracks in many places between here and Walkerton, and that in the large tamarack swamp south of Bradford the trees in July were as bare as if a forest fire had swept through them.

The adult insect is a handsome saw-fly, somewhat resembling the Currant Saw-fly but is a little larger and darker colored, being mostly black with an orange band around the middle of the abdomen. The female deposits her eggs in incisions made in the young terminal shoots. The young larvæ feed voraciously upon the tender needles and develop with wonderful rapidity. Some idea of their voraciousness, vast numbers, and rapidity of growth may be gained from the fact that the active larval state lasts but a single week, and during this short time they often strip bare vast forests of tamarack.

When mature, they drop to the ground and pass the winter in a dark brown, oval cocoon spun in the moss or grass beneath the trees.

So far as we have learned, there is but a single brood of them during the season, and this is quite enough. As it is, the defoliated trees throw out a second set of needles, and are thus enabled to survive one or two attacks, but when they are stripped of their foliage repeatedly the results cannot be otherwise than fatal. One or two natural enemies have been found preying upon the larvæ, and it is hoped that they may be able to hold them in check, because it is usually impossible to fight them by any of the modern means of insect warfare on account of the inaccessible nature of the places in which they breed. On single trees they may easily be destroyed by spraying, or even by shaking them to the ground, as they cannot crawl back upon the trees again.

3. THE TENT CATERPILLARS (*Clisiocàmpa americàna and C. disstria*). Among the Lepidopterous, or scale-winged insects, none attracted more attention last year than the Tent-Caterpillars. There are two species of these common to this part of the continent, one known as the Apple-Tree Tent-Caterpillar, and the other as the Forest-Tent-Caterpillar. The latter appeared last year in several parts of the province in vast armies. At one place on the W.C. & B. they were reported in the papers as having been in such vast numbers that they stopped a train. And judging from the plague of them which I saw on St. Joseph's Island, I am quite prepared to believe the reports.

A comparative study of the life histories of the two species is of interest. The adult insect in each case is a reddish brown moth measuring when the wings are expanded from one and a half to one and three-quarters inches across. In this stage they have no power of taking food, and live only long enough to provide for the generation to follow. The eggs are laid about the middle of July in ring-like clusters encircling the small twigs, usually from 200 to 300 eggs in each cluster. The eggs of the *Clisiocampa Americana* may be distinguished from those of the *Clisiocampa disstria* by the oval form of the clusters, those of the latter being squarely cut off at each end. In both cases the egg masses are covered with a thick coat of tough varnish which renders them waterproof, a wise provision of nature, as it is nearly nine months before the young caterpillars emerge from them. During the first warm days of spring they make their appearance, and after taking their first meal from the gummy substance which has protected them for the winter they begin to feed upon the opening buds.

The most striking difference in the two species now becomes apparent in the habits of the young caterpillar. Those of *Clisiocampa Americana* spin a tent in the nearest large fork of the branch upon which they are hatched. Into this they retire at night, during stormy weather, or when they are not feeding, in warm weather they often repose in a black mass upon the outside of it, leaving it regularly once in the forenoon and again in the afternoon to feed. Each caterpillar spins a silken web along the branch wherever it travels. Thus they never lose their way home although they may forage all over the tree. The caterpillars of the other species do not dwell in tents and are more disposed to lead a wandering life. When young they often march from place to place in single file close procession. From the time they are half grown until they reach maturity they are wonderfully active and move about as if they were in a great hurry and had no time to lose.

Both species reach maturity in about six weeks, and are then handsome hairy caterpillars, about two inches in length. *Clisiocampa disstria* has a row of white spots down the centre of the back, which distinguishes it from the other species, in which the white line is unbroken.

The Forest Tent-Caterpillar is a general feeder, living on a great variety of forest trees and often doing considerable damage in orchards. The Apple-tree Tent-Caterpillar is not such a general feeder, and is more frequently found on the apple or wild cherry. For the latter it has a particular preference. In our forest plantation where there are 15 or 20 different species of trees, it was noticed last spring that every tree of the wild cherry had two or three nests of these caterpillars, while not another tree in the plantation was affected.

Another difference between these two insects appears in the construction of their cocoons. Those of *Clisiocampa Americana* are formed of a double web, the outer one loosely woven and filled with a powderly substance resembling sulphur. They are usually hid in some out of the way place, as under rails, boards or rubbish. Those of *Clisiocampa disstria* have none of this powdery substance and are more frequently formed inside of the leaves hanging on the trees. On St. Joseph's Island last summer, I saw hundreds of maples and other forest trees upon which every leaf contained one of these concoons, even the native spruces were so full of them that they appeared as if packed in wool.

4. CANKER-WORMS.—(*Paleacrita vernáta* and *Alsophila pometária.*)—Canker-worms have been very abundant in many parts of the country for a number of years past. There are also two species of these, but they resemble each other so closely that to the causal observer they differ only in name. One is known as the Spring Canker-Worm (*Paleacrita vernáta*) (Fig. 63), and the other as the Fall Canker-Worm (*Alsophila pometária*) (Fig. 64). One of the most noticeable differences in the two species appears in the egg stage. The eggs (Fig. 63 *a* and *b*) of the Spring Canker-Worm are oval in form and are laid in the spring in irregular patches hidden under loose bark or in expanding buds.

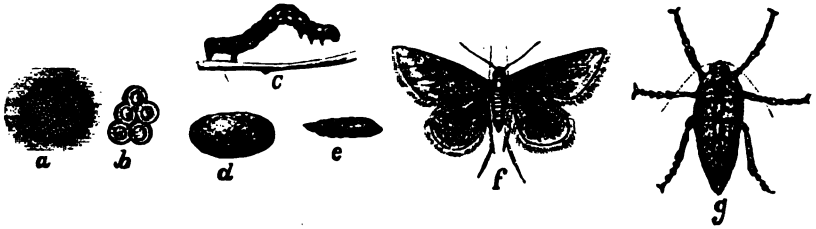


Fig. 63.

Those of the Fall species are shaped like miniature flower pots, are ranged in regular rows in masses (Fig. 65, *a*, *b*, *c*), and deposited in the late autumn in some prominent place on the tree. The larvæ of both species (Fig. 63 *c* and 65 *f*) make their appearance with the opening of the leaves in the spring. They reach their full size in about three weeks and are then about an inch in length. On account of their peculiar method of travelling, by alternately looping and extending their bodies, they are commonly spoken of as "measuring worms." They have another peculiar habit when disturbed of suddenly dropping from the tree and suspending themselves in mid air by a delicate silken web which is spun as they drop. Their appearance in this position is graphically described in the following letter which I received from a correspondent last June :—

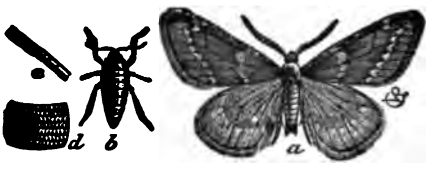


Fig. 64.

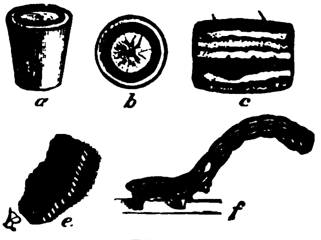


Fig. 65.

BRIGHTON, June 6th, 1898.

DEAR SIR,—Last evening my husband said, "Come with me, I wish to show you a sight." We went into the orchard. "Now," says he, "see that tree over there, the leaves are all eaten up." "Worms," says I. "Yes," says he, "but not the kind you know." He took a stick and gave a limb a tap, and in an instant one hundred worms were hanging by tiny webs. He then went around hitting all the limbs he could reach, and I think there must have been a million worms suspended in the air beneath that tree. "Now, May," says he, "what am I to do? I have manured and thoroughly worked this orchard for two years, have had it trimmeed, and the worms' nests all taken out of it once this spring, now just look at it." "I'll tell you," says I, "I'll write to the Agricultural College and see what they advise." An answer would be gratefully received, as the orchard is no small item in our accounts.

Yours truly;

——— ———.

In an orchard that is regularly sprayed they can give little or no trouble, as they are easily destroyed by Paris green, but in large shade trees, which are sometimes attacked, and where the spraying cannot easily be done, strategic measures have to be resorted to. From the fact that the female moth in both species is wingless, and after emerging from the pupa in the ground has to climb the tree to deposit her eggs, the placing of a tar band or other barrier upon the trunks of the trees at once suggests itself as a remedy.

5. THE COLORADO POTATO BEETLE.—(*Doryphora decem-lineáta.*)—The potato bug, or more properly, the potato beetle (Fig. 13) is with us yet, and he seems to be here to stay. Out of about ten thousand species of Coleoptera common to this country, the potato beetle stands out prominently as the one most generally troublesome. We have become so familiar with it that we seldom think of it but to kill it, yet a few facts as to its history in this country may be of interest. To the late Dr. C V. Riley, of Washington, we are indebted for the best account of it that has anywhere been published, and I have made free use of his little book on "Potato Pests," in the preparation of these notes.

The Colorado Potato Bug, as it has been commonly called, was first described under the scientific name Doryphora decem-lineata, by Thomas Say, in 1824. It was then to be found only in Colorado and the North-Western States, just this side of the Rocky Mountains. Its original food plant was the Sand Bur (Solanum rostratum) a species of wild potato peculiar to that region.

As civilization advanced westward and potatoes began to be grown in its native home, it gradually acquired the habit of feeding upon the cultivated potato, and began its eastward march from potato patch to potato patch. In 1859 it had reached to within 100 miles of Omaha City in Nebraska. In 1861 it invaded Iowa, and gradually during the next three or four years it spread eastward over the whole State. In 1864 and 1865 it crossed the Mississippi into Illinois, at four or five different points coming on in a column about 200 miles broad from north to south. It was then travelling at the rate of fifty miles a year and it was predicted that it would reach the Atlantic Sea board in 1881. On this side of the Mississippi, however, the potato fields were more plentiful and it began to make better time, actually arriving on the Atlantic coast in 1874, seven years ahead of time, its average rate of progress being 88 miles per year. This rate, however, was not uniform, the northern columns of the army made the most rapid progress; the southern columns travelling through a country where potatoes were not so much grown, and under a broiling hot sun, lagged far behind.

The invasion of Ontario began in July of 1870, at two points on the western frontier, namely, near Point Edward and near Windsor. During 1871 they came on in increasing numbers, and it was said that during that summer the Detroit river was literally swarming with them. They were crossing on ships, chips, staves, boards, or any other floating object that presented itself. By June of that year they were common around London, and, Mr. Squirrel informs me, that later that year they had reached as far as Galt. I can well remember the first one I ever saw; it must have been in the summer of 1872. I was then a little chap attending school on the historic battle field of Lundy's Lane, and I little knew then that I had met an enemy that would refuse to be driven from the country, for their invasion was one not only of conquest but colonization wherever they went.

A few beetles were sent to us last summer which were covered with a very interesting parasite known as *Uropoda Americana.* These are little mites about the size of a small pin-head, and of a flax seed brown colour. Each beetle was so thickly covered with them that hardly any part of its body was visible. The infested beetles were placed upon a potato plant along with some of their healthy relatives in hopes that their enemies might increase and subdue them, but after a few days the infested beetles had disappeared and the parasites with them, while the healthy beetles fed on serenely.

6. GRASSHOPPERS.—The grasshoppers belong to the Orthoptera or straight-winged insects. Of these we have a great many species, but they may all be grouped into two families—the Acridiæ or short-horned grasshoppers, and the Locustidæ or long-horned grasshoppers.

There has been much confusion of terms in the common names applied to these insects. The term locust properly applies to the first family, and not to the Locustidæ, or long-horned grasshoppers. The term locust is also improperly applied to the Cicada, which belongs to another order altogether. To all but entomologists, however, the members of both families are usually known as grasshoppers, and for convenience in this paper we shall use that general term.

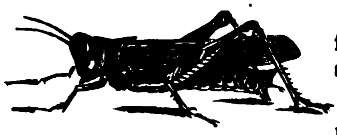


Fig. 66.

The most common species with us is the Melanoplus, femur-rubrum, the red-legged grasshopper, or, more properly speaking, locust.

The females of this species deposit their eggs in holes made in the ground by means of their ovipositors. The eggs are laid in masses in the fall of the year, and hatch during the following spring or early summer. The young do not undergo complete metamorphosis, or change of form, as do the insects of the other orders we have mentioned. There is no larval stage; the young make their appearance as little grasshoppers without wings. They pass through several moults, and the wings gradually develop. With the last moult they become full fledged, and their destructiveness is then increased by their increased powers of locomotion.

Grasshoppers are more or less troublesome every year in all parts of the country, but they are usually particularly plentiful in localities where there is much waste land or poor farming. Two years ago I wheeled through the country from Walkerton to Clarksburg, a distance of about fifty miles There was then in many places through which I passed almost another plague of locusts or grasshoppers. In conversation with a farmer whom I met I learned there were in some sections of that country quite a number of abandoned farms, where grasshoppers had been breeding year after year unmolested. Upon these farms they ate everything bare and then spread to adjoining farms. Good farming with clean cultivation and short rotation of crops is one of the best means of avoiding a grasshopper plague. On the College farm here Mr. Rennie tells me that since the fences have been removed, the permanent pastures broken up, and a short rotation of crops adopted, hardly a grasshopper could be found, whereas the old fence bottoms and permanent pastures were formerly alive with them.

7. APHIDS, OR PLANT-LICE.—Probably the most widely distributed and generally injurious insects during the past two years have been the Aphids, or plant-lice. They are members of the family Aphididæ, belonging to the section Homoptera, in the order Hemiptera. This section or sub-order Homoptera includes not only the Aphids but all of the bark lice, scale insects, mealy bugs, and leaf hoppers, some of the most injurious insects, and at the same time some of the most difficult to fight.

They are characterized, in common with all the other insects of this order, by a suctorial mouth, with which they take all their food in a liquid form, sucking it as juice om the plants upon which they feed. They are further remarkable for their insignifi- nt size and the wonderful rapidity with which they breed. There are a great many ecies of plant-lice, and they infest in one form or another a great variety of trees and lants. The tendency has been to name these according to the tree or plant upon hich they feed. One of the most destructive species in this and many others sections st year was the *Aphis brassicae*, or cabbage aphis, which affects cabbage, turnips, rape, nd other brassicaceous plants. Another was the Aphis mali, or apple aphis. On the erry there was a very troublesome black species known as Mysus cerasi, or the cherry- ee aphis. These are only a few of them, but they are all alike very troublesome in cking the sap and reducing the vigor of the plants upon which they feed.

Many species like those on the cherry, apple and plum, excrete a sticky liquid sub- ance known as "honey dew," upon which ants, bees, and flies regale themselves. The esence of ants running up and down the trees is almost a sure indication that aphids e at work upon the leaves. Other species, like those infesting the cabbage and rnip, excrete a white powdery substance which covers their bodies. In the woolly his infesting the roots of apple trees, this excretion is so fluffy that the insects appear be covered with wool.

The life history of plant lice is peculiar. The various species differ considerably in e details of the transformations, but the following may be given as applying to most them. The eggs which are shiny black are very large for the size of the insect, are id in the fall upon the food plant. From these hatch in the spring wingless females, hich without the intervention of the males soon begin to bring forth living young. five days or six days these young aphids begin to reproduce in the same way. This ocess of agamic reproduction and compound multiplication goes on so rapidly that in a ort time the progeny of the original "stem mother" mounts up into the millions. If is production of wingless forms continued long, it would mean the starvation of all, by e destruction of the plants upon which they were feeding, but Nature provides for this the development after a time of winged forms which "hie away to fresh fields and stures new," and in this way they spread. Often in the fall the air is so full of these ing aphides that a person riding or driving quickly becomes covered them. As the ld weather approaches and vegetation ceases, sexual forms, male and female are devel- ed, the females being wingless. Eggs are again produced to carry the species over to other year.

From the fact that Aphids and other insects of this order insert their beaks and ck their food from the interior of the leaves or stems, it is evident that the application stomach poisons such as Paris green can be of no avail in destroying them. The terial supplied must be something that will kill by coming in contact with their soft dies. The kerosene emulsion, so generally recommended, has been found to be more or s satisfactory, because of the frequent injury it does to the foliage upon which it is plied. Another remedy much more satisfactory, is a strong decoction of tobacco, de by boiling a pound of tobacco waste in five gallons of water, and this is made ubly effective by dissolving in it a quarter of a pound of whale-oil soap. This should applied as soon as the aphids appear, as after a time it becomes difficult to reach them ause of the curling over them of the leaves upon which they are feeding.

Nature's most active agents in holding plant lice in check are the Lady Birds. st summer these and their larvæ could be found actively at work devouring the lice on almost every tree and plant infested.

7. House-Flies.—(*Musca domestica, et al.*) Of all the insects that bother and noy the house keeper none are more common than the house flies. And notwith- nding this fact the woman, or man either, who can give a full account of the history of these flies is as rare as the one whose house is free from them during summer season.

All true flies belong to the order Diptera or two-winged insects. There are ral species commonly found in houses, although but one of these should properly be called the house-fly. This is the Musca domestica, a medium sized grayish fly too well known to need description.

The life history of this species, which is fairly typical of the majority of them, may be briefly outlined as follows: It passes the winter in the house or some other building, hiding in sheltered spots anywhere between the cellar and the garret. A few specimens in the warmed rooms occasionally hum about in the winter, reminding us that they have seen better days. In the early spring the few sole survivors of the swarms of the preceeding year make their appearance. These are mostly females ready at once to become mothers and by the end of the season their children and great great grand children extend to the tenth and twelfth generations. Each female lays on an average about 120 eggs at a time, which are deposited in irregular masses usually in horse manure. The eggs hatch in about twenty-four hours and the larvae coming from them are white footless maggots about half an inch in length. In this stage of its existence the fly is beneficial as a scavenger. In from five to seven days the larvæ attain their full size, and enter the pupa or resting state. In its outward appearance the pupa is a smooth brown oval shell about a quarter of an inch in length and less than half of that in diameter. In manure heaps these may often be gathered by the shovel-full. In some investigations conducted at Washington last summer, as many as 1,200 larvæ and puparia were counted in one pound of horse manure. The pupa stage also lasts only from five to seven days. So that to produce a full fledged fly from the laying of the egg requires only about ten days or two weeks.

To trace the development of the fly through all of these stages is very easy, but to ascertain the length of life of the adult fly is more difficult, and as yet I have seen no data on the subject. The Washington experimenters declared that this was a bit of information almost impossible to obtain correctly, because of the inability of the fly to live in close confinement. Here then is a point in the life history of one of our commonest insects about which we are yet more or less in the dark.

A few of the other species of flies commonly found in houses may be mentioned. The one most closely resembling the house fly in appearance is the *Stomoxys calcitrans*, or stable fly, so troublesome upon horses and cattle. The most important difference in this species is that the mouth parts are formed for piercing the skin. A bite from one of these is just as painful as the sting from a bee, but it has not the same poisonous after-effects.

One of the largest species found in houses is the *Calliphora vomitoria*, or "blue-bottle fly," that big, blue, buzzing, bummy, beggar that goes tearing through the house from room to room as though he owned the premises. He is capable in a few minutes of arousing more fight in a woman than all the other flies combined. A favorite place for this species to lay its eggs, is in meat that has been exposed for a short time. As with most other flies, the time required for development is short, and the rate of increase is so rapid that it has given rise to the saying that a pair of these flies will devour an ox more rapidly than a lion,

One of the smallest species seen in houses, the *Homalomya canicularis*, is sometimes called the small house-fly. This species is largely responsible for the prevalent but erronous idea that little flies become big ones.

In closing this paper we should like to enter a plea for a more general study of this most interesting branch of natural history. In none do we find a greater range for observation and research, and in none can practical investigation be turned to more profitable account.

NOTES OF THE SEASON OF 1898.

By J. Alston Moffat, London, Ont.

One of the most noticeable pecularities of the Entomological year about London, was the scarcity of diurnals; many of the more common forms being to all appearance entirely absent. There were some noticeable exceptions to the rule, *Pieris rapae* for instance. From the early part of May to the end of the month, it was in unusual abundance for the spring brood. More like what one is accustomed to see in the autumn about cabbage and turnip fields; indeed it was more plentiful in the spring than at any other time of the year, something unusual in its history, and starting the inquiry, what had become of its faithful attendant parasite *Pteromalus puparum?* The yellow swallow-tail *Papilio turnus*, appeared in moderate numbers, also *Limenitis ursula*, whilst that nearly ubiquitous butterfly *Colias philodice* that helps to give life and animation to every rural scene was rarely seen. I am not certain that I saw a Milkweed butterfly, *Danais Archippus* about London until the middle of September. The larger silver-spotted frittillary *Argynnis* were noticeably scarce; and so on through the entire list of common forms; which made the meditative contemplation of a landscape dull and uninteresting by reason of their absence.

Collecting at electric light commenced early and continued good up to the end of June, many interesting and attractive specimens being obtainable by that method. The early geometers and some species of the noctuids were in abundance, whilst hybernated specimens of Scopelosoma and Lithophane were plentiful, and many of them were in excellent condition. *L. antennata* must be a very hardy insect, and capable of enduring extremes of cold; Mr. Bice having found specimens of it about the lights during the months of January, February and March; the least indication of mildness in the weather was sure to bring it out. July and August were characterized by more their usual unprofitableness to the collector, giving him plenty of hunting but little collecting. There were no reports of any serious injury having been done in this locality to crops or fruits from insect pests. Many of the ornamental bushes and shade trees of the city were rendered unsightly by the presence in great numbers upon their branches of the Cottony Scale, *Pulvinaria innumerabilis*, but the attack passed off without any apparent injury resulting.

On the 2nd of June I received from J. D. B. Mackenzie, Esq, of Chatham, N. B., a letter, stating that he had sent to me for identification, some insects that had appeared upon his cherry trees and literally stripped them of their foliage in two or three days. The insect proved to be *Ademonia rufosanguinea*, Say, of the Chrysomelid family; an innocent enough looking little beetle that would not be suspected as being capable of working such destruction. It must surely be a rather unusual occurrence? Their numbers must have been great. He also wished for information as to where he could get a description of its life history? That I could not give him.

On the 27th of July I received from Clinton, Ont., a box six inches long by four wide and one and a half deep, filled with the remains of Web-worm moths, *Clisiocampa Americana* and *disstria* mostly; said to have been the result of one night's capture in one street lamp—kind of lamp not stated, electric probably. I had read in the newspapers earlier in the season, accounts of the running of railway trains being interfered with in some localities, by reason of the swarms of caterpillars on the track; that may have been one of the localities. At all events, that boxful gave evidence of great negligence on the part of those interested, in their dealings with their tent caterpillars.

On July the 22nd, I took a trip to Lake Erie Shore. I had heard a good deal about 'Rondeau,' the Government reserve and the public park there, and that it was easily reached by rail from Chatham, Ont., so I thought it might be a profitable place to spend a day or two. In anticipation I was going to a place well wooded and wild; but instead, I was landed far out upon a sand-bar almost entirely destitute of vegetation. This sand-bar is what separates Rondeau (round water, admirably descriptive) from Lake Erie, whilst the Government reserve is on the opposite side of the bay, nine miles or so away in a straight line and no convenient means of reaching it; and as my time was limited I made no effort to do so. The sand-bar is being utilized for summer residences with its excellent boating and bathing privileges, and is locally known as 'Erieau,' a euphonious combination but lacking in correct significance. In such conditions there was but little opportunity for me to indulge in my favorite pursuit; yet even there I came upon two insects which I had never met with alive before. One was that highly ornamented little dragon fly, *Celithemes Eliza*, Hagen, which was quite plentiful amongst the straggling milkweeds and wild rice growing along the bay side of the shore, and was in fine condition as if recently emerged. The abdomen of one sex is ornamented with bright red, the other with yellow, but their brilliance disappears in drying. In company with it, but in greatly inferior numbers was *Celithemes Eponina*, Drury, which used to be plentiful in one locality at Hamilton. The other find was that attractive Hemipteron *Lygaeus fasciatus*, Fab. Although milk-weeds were to be found for hundreds of yards along the bay shore, there was but one spot where I saw it, and that was a small clump situated between two cottages, and from which by frequent visits I secured seven of them. There I observed on the wing as the first of the season, a few fine fresh specimens of the milk-weed butterfly, *D. Archippus*, Fab.

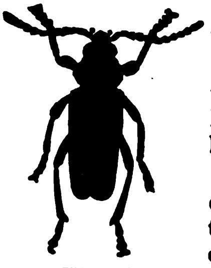


Fig. 67.

In July, Dr. W. J. Stevenson brought to me a fresh maple tree borer, *Plagionotus Speciosus*, Say, (Fig. 67) the first living specimen of it I have seen taken at London. I could obtain it at Hamilton by the dozen where the shade trees are nearly all hard maple, whilst in London they are as nearly all soft maple; and to that as a cause I have always attributed its absence here.

During the autumn there was the usual appearance in abundance of two or three species of the Cut-worm moths at light, whilst amongst them was to be obtained an occasional rare and desirable specimen of other kinds. About the end of September Mr. Bice secured a number of that attractive Pyralid, *Eudioptis hyalinata*, Linn. It was on the 29th day of September, 1881, that I saw at Hamilton my first specimen of it on the wing, and so far as is known, very few have been taken in Ontario since, and not more than a single specimen in a season. This disclosure of such a marked increase in numbers is of considerable importance to the community. as indicating the possibility of its becoming here, such as it has proved itself to be in the Western and Southern States a first class pest to the cultivators of that delicious fruit, the musk melon. In the Eleventh Report of the New York State Entomologist for the year 1895, after giving an account of the total destruction of some melon patches in the south, which had been cultivated for the market, at page 138 it is stated: "It would appear from the limited literature accessible, that *Eudioptis hyalinata* is more especially a southern insect. I have examples in my collection from Texas. It has also been taken in Michigan, is not uncommon in New Jersey, and has been taken in Canada. I have no knowledge of its occurrence in the State of New York." That it had not been reported from New York State was to me rather a surprise, and I started the question whence came it to us? It would seem as if it must have reached Ontario by way of the west, having found the conditions most favorable for its spreading in that direction. It is the habit in some quarters to speak disparagingly of "mere collectors." But an occurrence of this nature brings forcibly to view the great loss, that even now, our department of science is suffering from the want of more collectors; for it is upon their labors and observations that we are largely depending for our knowledge of the introduction and spread of injurious species. A knowledge of the flora and fauna of any particular district is of great general interest and advantage to all students of nature, whether the individual disclosing it has any time, inclination or ability to devote to the technicalities of the subject or not, and is well deserving of the grateful acknowledgements of all.

Almost the same time as the preceding, Mr. Bice took several specimens of another Pyralid, *Pilocrosis ramentalis*, Led. This species was represented in the Society's collection by a single specimen taken by me at Hamilton, and named for me by Mr. Grote, then of Buffalo, who had much of interest to tell me of the peculiarities of this insect, one noticeable thing about it is the long scales covering the costal margin at base of the front wings of the females, which can be raised so as to disclose the membrane. Mr. J. Johnston of Hamilton informed me that these two species are represented in his collection by a single specimen of each, taken by him there many years ago. Recently I have seen a specimen of *E. hyalinata* amongst some material sent to me for determination by Mr. C. E. Grant, of Orillia. In September the Tomato Sphinx, *S. quinquemaculata*, Hub, was quite plentiful, which suggests some interesting queries concerning the life history of this species. It is considered to be single brooded in this latitude; but it is known to mature occasionally in confinement the same season as produced. Were these

September specimens from eggs of an early brood, or were they from belated chrysalids of the previous summer's production? It has been observed that there is a great differance in the time of their appearance in nature, some showing themselves in early June, whilst fresh specimens may be obtained at the end of July; the location of the winter quarters of the pupæ influencing the time of maturing to some extent most likely. Again, if these late comers produced ova could they pass the winter safely? If not, then it would help materially to reduce the numbers for the following season. Of Sphingidae less frequently met with in this locality, Mr. Bice took specimens of *Ampelophaga versicolor* Harr. The Tobacco Sphinx, *S. Carolina*, Linn., and *S. Cingulata*, Fab., or *Convolvuli* of Linn. One thing secured by him, and determined by Dr. J. B. Smith, which is new to the Society's collection, is a single specimen of *Hydroecia limpida*, Guen., whilst several other Noctuids of the season's capture are not yet identified.

THE FREEZING OF INSECTS.

By Henry H. Lyman, Montreal.

In the 22nd Report of the Entomological Society of Ontario, being that for 1891, there appeared a paper from my pen under the title, "Can Insects Survive Freezing?"

I have recently come across further records of observations upon this subject, and deem them of sufficient interest to be republished.

In looking over an interesting book of travels, entitled "A journey from Prince of Wales's Fort in Hudson's Bay to the Northern Ocean, undertaken by order of the Hudson's Bay Company for the discovery of copper mines, a North West passage, etc., in the years 1769, 1770, 1771, and 1772, by Samuel Hearne," published in 1796, I came across the following interesting notes on page 397. :—

"Frogs, Grubs, and other Insects."

"Frogs of various colours are numerous in those parts as far north as the latitude 61°. They always frequent the margins of lakes, ponds, rivers, and swamps; and as the winter approaches they burrow under the moss at a considerable distance from the water, wher they remain in a frozen state till the spring. I have frequently seen them dug up with the moss (when pitching tents in winter) frozen as hard as ice; in which state the legs are as easily broken off as a pipe stem, without giving the least sensation to the animal; but by wrapping them up in warm skins, and exposing them to a slow fire, they soon recover life, and the mutilated animal gains its usual activity; but if they are permitted to freeze again they are past all recovery, and are never more known to come to life. The same may be said of the various species of Spiders, and all the Grub kind, which are very numerous in those parts. I have seen thousands of them dug up with the moss, when we were pitching our tents in the winter; all of which were invariably enclosed in a thick web, which Nature teaches them to spin on those occasions; yet they were apparently all frozen as hard as ice. The spiders, if let fall from any height on a hard substance, would rebound like a grey pea; and all the Grub kind are so hard frozen as to be as easily broken as a piece of ice of the same size; yet when exposed to a slow heat, even in the depth of winter, they will soon come to life, and in a short time recover their usual motions."

In Dr. H. Guard Knaggs' Lepidopterist's Guide, on page 44 of the 1871 edition, under the heading of "Ailments of Larvæ," I find the following :—

"Frost Bite.—It is well known that larvæ, which have been so stifly frozen that they might have been easily broken, have afterwards recovered. The chief thing to be remembered in the treatment of such cases, is that the thawing should be effected very gradually, rapid thawing being dangerous."

ODOUR OF THE SAN JOSE SCALE, *Aspidiotus perniciosus*

BY F. M. WEBSTER, WOOSTER, OHIO.

In the many accounts of this insect I do not recall that attention has been called to the odour that is associated with this insect and which in cases of excessive abundance, can be detected at a considerably distance away. Where the air is quiet it is often possible to detect the presence of a badly infested tree a yard away, and I presume that with more acute olfactories, such as insects are supposed by many to possess, even the presence of a more limited number of the scale might be detected at a much greater distance. As ants do not appear to be at all partial to this Coccid, at least in this country, it is not easy to understand what influence this odour can have in the economy of the species. It is possible that, in its native home, this odour might attract other insects and thus afford a means of diffusion, not at present so available to the scale in this country.

THE ODOUR OF COCCIDÆ.—Prof. Webster's interesting note leads me to offer a few remarks. The species of the subgenus of *Toumeyella* of *Lecanium* have quite a strong musky odour; but ordinarily I have been unable to detect any marked odour in species of Coccidæ. I suppose, however, that all possess some odour, and that its purpose is to attract the males to the females. This seems the more probable when we remember that in many species the male puparia are not on the same part of the plant as the females. Here at Mesilla Park, also, I have lately seen a male of *Margarodes hiemalis*, Ckll. ined., run over the ground until it detected a spot where a female was buried, and then dig down to the female. It must certainly have detected its mate by the sense of smell

T. D. A. COCKERELL.

LIFE HISTORY OF THE SHEEP SCAB-MITE, *Psoroptes communis.*

BY C. P. GILLETTE, FORT COLLINS, COLORADO.

I am not aware that the full life-history of this insect has been published, though I shall not be surprised to learn that such is the case.

In order to know how long a time should intervene between the first and second dippings for the cure of scab, we must know the period of incubation and also the entire time elapsing from the deposition of the egg up to the time that the mite from that egg, if a female, may be itself depositing eggs. These points were determined in a series of experiments conducted by the writer one year ago and were reported in a local paper, the "Fort Collins Courier," last spring. I took seventy-five eggs from a lock of wool drawn from the back of a badly infested lamb and, after dividing them in two nearly equal lots, placed them at once on the skin of the backs of two lambs that were not infested with the mites at the time. In order to irritate the surface a little and better prepare it for the little mites that would begin at once to hatch, a lock of wool was drawn in each case from the particular spot where the eggs were placed.

Mr. Ball, assistant in my department, made a special examination of these "cultures" once a day until the mites from the eggs were fully grown and themselves laying eggs.

At the first examination a few young mites were found, which was to be expected as a few eggs among so many would be about ready to hatch. At the end of the fourth day all the eggs had hatched. At the end of the ninth day a few individuals were found in copula, and on the eleventh day eggs were found. As it required four days for the newly deposited eggs to hatch, the entire time elapsing from egg to egg would be fourteen or fifteen days.

As there would be eggs in all stages of incubation upon a sheep when the latter is dipped for the cure of scab, I have set the limit of time for the second dipping at not sooner than five days and not later than ten days after the first dipping. If the second dipping comes at a time outside this limit, there will probably be eggs upon the sheep again.

OBITUARY.

PROFESSOR J. HOYES PANTON, M.A., F.G.S.

It is our sad duty to record the death of Professor Panton, which took place at Guelph, on the 3rd of February, 1898, after a long and very painful illness, which he bore with the utmost patience and resignation. He was born at Cupar, in Fifeshire, Scotland, and was brought out to Canada when a child; his father settled in Toronto at first, and removed, after some years, to Oshawa. He was educated at the Whitby High School and Toronto University, where he graduated with honors in Natural Science in 1877. The following year he was appointed Professor of Chemistry in the Ontario Agricultural College, but after a few years resigned the position and removed to Winnipeg, where he became principal of the Collegiate Institute. In 1885 he accepted the invitation of the Ontario Government and returned to Guelph, where he filled the position of Professor of Natural History and Geology in the Agricultural College till the time of his death. His work there had special relation to economic entomology and botany, on which subjects he issued many useful bulletins to farmers and fruit growers. He also published two small works on Economic Geology and "Insect Foes," which are valuable manuals of an elementary character. In 1896 Professor Panton attended for the first time the annual meeting of the Entomological Society of Ontario, though he had long been a member, and on that occasion read very interesting and useful papers on "Entomology for Rural Schools" and "Two Insect Pests of 1896—the Army Worm and the Tussock Moth." At the annual meeting in October, 1897, he was elected vice-president of the Society, but was unable to attend owing to the illness which had already seized upon him. The following resolution of condolence was adopted at a meeting of the Council held in March: "The members of the Council of the Entomological Society of Ontario have heard with profound regret of the death of their highly respected colleague and vice-president, J. Hoyes Panton, M.A., F.G.S., Professor of Biology and Geology in the Ontario Agricultural College, Guelph They desire to place on record their admiration for his talents and attainments in natural science, and their deep sense of the loss which economic entomology in this Province sustained by his removal in the maturity of his powers and at an age when he was capable of performing much useful work. They beg to offer to Mrs. Panton and family their respectful sympathy in the great bereavement which has befallen them."

On the 18th of February, 1898, Mr. **JOHNSON PETTIT** died at Buffalo, N.Y., and was buried a few days later at Grimsby, Ont. For many years Mr. Pettit was a most diligent and successful collector of Coleoptera in the neighborhood of Grimsby, and was well known amongst entomologists both in this country and the United States. After forming a very complete collection of the beetles of Ontario so far as known at that time, he gave up the pursuit and turned his attention to geology. Subsequently he sold his cabinet of insects to the Entomological Society of Ontario at a nominal price, in order that it might be kept in a place of safety and preserved from destruction. His work was characterized by remarkable neatness and painstaking accuracy.

PROFESSOR DAVID SIMONS KELLICOTT was born at Hastings Centre, Oswego County, N.Y., January 28, 1842, and died at his home in Columbus, Ohio, April 13, 1898. In his boyhood his frail constitution and delicate health required him to spend much of his time out of doors, and it is to this, no doubt, that in part at least his love for nature may be traced. He graduated from Syracuse University with the degree of B. Sc., while the institution was yet known as Genesee College, teaching one year in Southern Ohio prior to his graduation. After graduating, he taught one year in Kingston Normal School, Pennsylvania, after which he was connected for seventeen years with the State University, at Buffalo, N.Y., being Dean of the College of Pharmacy, and also Professor of Botany and Microscopy. He came to the Ohio State University in 1888, where, for ten years, he has occupied the chair of zoology and entomology. At the time of his death he was General Secretary of the American Association for the Advancement of Science, President of the American Microscopical Society, and Treasurer of the Ohio Academy of Science. He had served as President of the Buffalo, N.Y., Academy of Science, and the Ohio Academy of Science.

Animal parasites of fishes, and the rotifera, from time to time claimed a considerable portion of Professor Kellicott's attention, but his entomological work won for him the admiration of the entomologists of America. Patient, conscientious and utterly devoid of selfishness, he was one of the most kind and loveable men the writer has ever met. Faithful and just with his colleagues and the idol of his pupils, seeking patiently and industriously after the truth, he won esteem while living, and in his death he has left numberless friends to mourn his loss. If there was ever a man who deserved the reward: "Well done, thou good and faithful servant," that man was David S. Kellicott; and the fruits of his labors will stand as an enduring monument to his faithfulness among his fellow men. He began to contribute to the Canadian Entomologist in 1878, his last article appearing in 1896. F. M. WEBSTER.

DR. JOSEPH ALBERT LINTNER.

By the death of Dr. J. A. Lintner, which occurred at Florence, Italy, on May 6th economic entomology has lost one of its oldest, ablest, and most distinguished devotees. He was of German parentage, and was born at Schoharie, N.Y., February 8, 1822. He graduated from the Schoharie Academy at the age of fifteen, and for the next thirty years was actively engaged in mercantile pursuits in New York City, Schoharie and Utica. The study of natural history became a fascination for him early in life, and in 1853, he turned his attention especially to insects and rendered valuable aid to Dr. Fitch, who was then making an entomological survey of the State of New York.

Dr. Lintner's first paper upon insects was published in 1862, and six years later he became zoological assistant in the New York State Museum of Natural History. He continued in the service of the State until his death, working as assistant in the Museum for twelve years, and in 1880 receiving the appointment of State Entomologist. This thirty years of continuous, active service in an official capacity, in a useful and limited scientific field, and in a single State, is certainly a remarkable record, and one which speaks volumes of praise for Dr. Lintner.

He richly deserved the honour of the degree of Ph. D. conferred upon him in 1884 by the University of the State of New York. He was also honoured with the presidency of several scientific associations, and his name is enrolled among the members of many entomological and other scientific societies, both in America and in Europe. The publications of Dr. Lintner merit the highest praise and deservedly entitle him to the foremost rank among the economic entomologists of the world. He published more than a thousand miscellaneous articles upon injurious insects, besides his four important "Entomological Contributions" and his twelve reports as State Entomologist; probably the thirteenth report, for 1897, is in the printer's hands.

These reports are justly entitled to the highest rank among the scientific publications of the great Empire State. They represent the highest ideal or model of what such reports should be, both from a scientific and a practical standpoint. For typographical neatness and scientific accuracy, for the simple, yet elegant and dignified, way in which dry, scientific facts are made interesting and adapted to the understanding of the agriculturist, Dr. Lintner's reports have not been excelled in the world's entomological literature; such indexes as his reports contain are rare in any literature. One is still more impressed with the scientific and literary attainments of Dr. Lintner, when one understands that, practically, he never had any of the modern facilities, such as are found at many of our experiment stations, for studying the habits of insects; his office was his literary sanctum, laboratory, museum, library and insectary combined.

Dr. Lintner was a man of quiet and dignified manners, always courteous and pleasant to meet in social intercourse. He was ever ready to impart from his vast fund of knowledge; and being an expressive speaker, he always commanded the attention of scientific bodies which he was called upon to address. His frequent addresses before horticultural and agricultural societies in his own and in other States, and farmer's meetings of all kinds, were always full of information.

He had recently been granted a well-earned six month's leave of absence, and was spending it in sunny Italy when the death summons came. In Dr. Lintner the agriculturists of New York found one of their best and most helpful friends, and entomologists the world over, a true and sympathetic co-worker. His name well deserves a place in that list of names enshrined in the hearts of every American economic entomologist—Harris, Fitch, Walsh, Le Baron, Riley—and Lintner.

M. V. SLINGERLAND.

BOOK NOTICES.

TWENTY-FIRST REPORT OF OBSERVATIONS ON INJURIOUS INSECTS and Common Farm Pests during the year 1897, with Methods of Prevention and Remedy. By Eleanor A. Ormerod, London: Simpkin, Marshall, Hamilton, Kent & Co., 1898 (1s. 6d., pp. 160.)

We beg to offer our hearty congratulations to Miss Ormerod on the publication of the twenty-first of her Annual Reports. Twenty-one years is a long period for anyone to carry on a laborious work, but this talented and indefatigable lady has not only accomplished a most valuable and important work, she has done so without any assistance except that of her late lamented sister, and entirely at her own expense. On this side of the Atlantic, Reports of this character are published by the Government of the Province or State to which they belong, but in England no official recognition has been shown, and though the country has undoubtedly been saved hundreds of thousands of pounds by the instructions given in these Reports to the farmers and gardeners of Great Britain, whereby they have been able to intelligently cope with their insect foes and employ the best methods of prevention of their attacks, yet no aid has been afforded her from the public purse—no recognition of the immense value of her work has been vouchsafed by the powers that be. But while officially ignored, Miss Ormerod's name and work are held in the highest honour throughout Great Britain and treated by the press in every department with the utmost respect; and in many British colonies and several foreign countries her name is widely known and her talents fully recognized.

A single observer, however able and industrious, could not possibly pay attention to all the manifestations of insect injury throughout the British Isles, but Miss Ormerod has by degrees gathered together a corps of observers in every county and district throughout the United Kingdom; and is kept closely informed of all that causes injury or loss to crops or fruit, and to live stock as well. During the past year she received about 3,000 letters on Entomological subjects, and with the aid of a secretary was enabled to attend to them all. She thus conducts at her own charges what ought to be a Division of Entomology in the Department of Agriculture at London.

In the Report before us thirty-six species of insects are dealt with and figured, their ravages described, and methods of prevention and remedy fully given. Several of them are familiar to us on this side of the Atlantic, e. g. Apple Codlin Moth, Cockroaches, *Xyleborus Xylographus*, Mediterranean Flour-Moth (*Ephestia Kuhniella*), etc.

From the care and accuracy which characterize her descriptions and figures, Miss Ormerod's work is of permanent value to economic Entomologists everywhere, and her reports are always received with welcome and gratitude by those who have the good fortune to obtain them. That she may long be spared to carry on her admirable work is the earnest aspiration of her many friends.

C. J. S. B.

OUT DOOR STUDIES: a Reading Book of Nature Study, by James G. Needham; 1 vol. pp. 90. New York, Cincinnati, Chicago: American Book Company.

These are a series of stories of animal life, written in a charmingly interesting way, and designed to lead on a youthful reader to observe for himself the wonders of nature that are everywhere open to his view. It begins with an account of the common wild Snap-Dragon or "butter and eggs," and tells how the peculiar structure of the flower is designed for the visits of the bumble-bees who come for the nectar and carry off the pollen as well. The next chapters are on Chipmunks; Galls and their makers; the Golden-rod and its visitors and tenants; Crows and their Doings; Dragon-Flies which, as our readers may remember, have been special objects of the author's studies; Eye-spots on insects which aid in the protection of their owners; and Ant-lions. Any boy or girl, who takes up the book and dives a little way into its pages, will surely read on with delight and when the little volume is closed, be anxious to sally forth and see if he (or she) cannot find some similar marvels of nature and learn their meaning, while admiring their beauty.

The book is one of a series designed for the use of school-children who are about to enter the High Schools. It is beautifully illustrated with about ninety wood-cuts, the work of Mrs. Needham, the author's wife, and is provided with an index, and a list of the scientific names of the animals and plants referred to in the text.

C. J. S. B.

THE PTEROPHORIDÆ OF NORTH AMERICA, by C H. Fernald, A.M., Ph.D., Revised Edition. July 30th, 1898. Boston: Wright & Potter Printing Co., 18 Post Office Square, 1 vol, 8vo, 84 pp., 9 plates.

Any one who has a copy of Professor Fernald's manual of the Crambidæ of North America will hardly need to be told that this later work is exactly what every student or collector of the Micro-lepidoptera wants, and that the way is now made easy for him when he wishes to identify his Plume-moths and learn all that is thus far known about the North American species. It is characterized by its author's well-known accuracy and conciseness of statement, and is a complete monograph of the family as far as this continent is concerned. It begins with an historical account of the family in the writings of European Entomologists and the more recent publications in America. This is followed by short chapters on the structure, habits, early stages and systematic position of the Plume-moths. The body of the work is taken up with descriptions of the genera and species, including very useful synopses in each case. Three of the plates illustrate the external anatomy and the structure of the wings, the remainder depict the genitalia of the species. We miss, however, the exquisite coloured plates that so beautifully illustrated the Crambidæ. We need not say more than that this is a full and entirely satisfactory work on the Pterophoridæ and that it maintains the high standard of excellence that we now expect in the author's scientific productions.

C. J. S. B.

AGRICULTURE, by C. C. James, 200 pp., George N. Morang, publisher, Toronto, 1898.

It has been the lot of few authors to accomplish satisfactorily what in their preface they state to have been their object as Prof. James has in preparing the 200 page Manual of Agriculture which has lately been given to the farmers of Canada. The author has had special opportunities, which he has made the most of, of learning not only what was needed by the intelligent farmers of the Dominion, but what was the best way of presenting this information to them. Both as Professor of Chemistry at the Ontario Agricultural College and as Deputy Minister of Agriculture, Prof. James has been brought into close contact with the leading and rising farmers of Ontario. The new Manual will fill a decided want, which is none the less from the fact that this want may not have been noticed by some until their attention was drawn to it by seeing how well it has been filled.

The purpose of the book is "to aid the reader in acquiring a knowledge of the *science* agriculture, as distinct from the *art* of agriculture, that is, a knowledge of the 'why,' ther than a knowledge of the 'how.' The science of agriculture may be said to consist a mingling of chemistry, geology, botany, entomology, physiology, bacteriology, and her sciences, in as far as they have a bearing upon agriculture. The aim has been to clude but the first principles of these various sciences and to show their application to e art of agriculture. . . . An intelligent understanding of the science underlying e art of agriculture will add much interest to what is otherwise hard work, and as a tural consequence, the pleasure of such work may be greatly increased."

Every day the fact is being recognized more and more that the elements of those iences which underlie all progress in every branch of agriculture *must* be taught in the ablic and High Schools of the country. Already simple nature studies and the first eps in chemistry and geology are taught in the schools of Manitoba and Ontario, and ese studies have proved to be not only of use and attractive to the students, but a ady means of creating a bond of sympathy between the teacher and his pupils; more pecially has this been the case with those energetic and restless souls too often now lled "bad boys" more, perhaps, from lack of understanding or skill in management on e part of the teacher than from a superabundance of real badness on the part of the ught. Boys play truant because they find more to interest them outside the school an at their desks. If therefore the things which appertain to out-of-doors can be ought inside the schoolroom without robbing them of too much of their outside vor, they will be a sure bait to catch the attention of all bright healthy boys and girls. heir study will arouse interest at once and the habits of concentration, power to observe d compare, and the necessary development of the faculties of exact thought and curate description will be available for all other branches of study with which the pil is engaged.

This book may be used as a text-book in High Schools and Public Schools. It ould be well indeed for Canada if its use were made compulsory in every school in the nd. The great truths laid before the reader are presented in a simple straightforward anner intelligible to all. The subjects are so skilfully arranged and concisely stated at a surprising amount of accurate information is given in this small octavo of 200 ges. The value of this simple knowledge to practical men is not, I believe, overstated hen I aver that if all the farmers in Canada would read this little work, as they most rtainly should, its appearance would mark an epoch in the history of the Dominion, hich would be made manifest to all by an enormous increase in the crops and wealth of e whole country.

The scope of work is shown by the following brief epitome of subjects: Part I. treats the Plant, its development, structure, food and functions; Part II, Soil, its nature d treatment; Part III., Crops of the Field; Part IV., The Garden, Orchard and Vine-rd; Part V., Live Stock and Dairying; Part VI., Bees, Birds, Forests, Roads and the ome.

In these different sections the insect and fungous enemies of crops are treated at me length. This little volume is bound in cloth and well got up; although some of e illustrations are rather roughly executed, it is on the whole most excellent and for e price, 25 cents is a marvel of cheapness.—J. F.

THE WINTER FOOD OF THE CHICKADEE, Bulletin 54, New Hampshire College of griculture, by Clarence M. Weed—There is something particularly charming about ose confiding little feathered denizens of the woods which brave our cold northern nters and stay to cheer us at a time of the year when there is so little animated life. e Chickadee or Black capped Tit-mouse (*Parus atricapillus*) is at once one of the most eerful as well as one of the most useful of our common native winter birds. What a ight, busy, happy sight is presented by a flock of these little friends; for they are all ends these little balls of black satin and grey down, they are far too busy and well ployed to waste time in fighting. Satan has a hard time of it in "some mischief ding" for these little fellows to do, for their hands are never idle, as they hurry through the woods, running up or around the trunks of trees or hanging head downwards from a slender twig, never still for more than an instant, as they peer into every tuft of moss, every crack or cranny in the bark, along the twigs, under the bud scales of deciduous trees or among the leaves of evergreens, talking cheerfully to themselves and each other all the time as they carry out their useful mission in clearing the trees and shrubs of countless insect enemies; woe to the luckless caterpillar, chrysalis, spider, or beetle which comes within the range of their sharp black eyes. Nothing comes amiss to these insatiable hunters, from the minute, shining black eggs of an aphis to the fat chrysalis of a Cecropia Emperor Moth; with deft blows the hard sharp beak soon penetrates the thick silken cocoon and in a very short time the marauder is away looking for another victim. Dr. Clarence Weed publishes in this interesting bulletin the results of some careful investigations which he has carried out as to the winter food of the chickadee. He shows that more than one half of the food of this bird during the winter months consists of insects, a large portion being in the form of eggs. Vegetation of various sorts made up a little less than a quarter of the food, and two-thirds of this quarter consisted of the buds or bud scales which were believed to have been accidentally eaten along with the eggs of plant-lice. These eggs made up more than one-fifth of the entire food and formed the most remarkable element of the bill of fare. This destruction of myriads of eggs of the plant-lice which infest fruit, shade and forest trees is probably the most important service which the chickadee renders during his winter residence. More than 450 of these eggs are sometimes eaten by one bird in a single day as well as the eggs of many other kinds of our most important insect enemies of the forest, garden and orchard. Dr. Weed figures in his bulletin some twigs of various trees upon which the eggs of insects have been deposited. Among these are represented the egg masses of the tent caterpillars and the Fall Canker-worm, both of which are favourite foods of these useful little birds. In addition to eggs or insects, many caterpillars and other stages in the development of insects are destroyed. One interesting figure shows the winter cases of a small caterpillar, closely hidden behind apple buds; these are, in all probability, those of the Eye-spotted Bud-moth, sometimes one of the most troublesome and destructive enemies of the fruit-grower. This bulletin shows much careful work in a field which has been, to a large extent, neglected by entomologists, and Dr. Weed should receive the thanks of all lovers of birds for the proofs which he furnishes of the real benefits we receive from these little favorites. It was pleasing for some people to know and most people to think that these birds were useful, but it is now possible to prove it to all who are willing to learn.—J. F.

SCUDDER'S REVISION OF THE MELANOPLI.

One of the most important works on Entomology which has been issued by an American author in recent years is that entitled a "Revision of the Orthopteran Group Melanopli (Acridiidæ) with Special Reference to North American Forms" by Samuel Hubbard Scudder.* It is more important because it deals with a representative North American group of insects whose members, between April and November, leap from our pathway in profusion whether we stroll through open woodland, sunny meadow, or along the roadside, and yet of whose classification and nomenclature the greatest confusion has heretofore existed. It was only another example showing the truth of the old saying: "that the common things around us are those of which we are most densely ignorant."

True, of one of the members of the group, the "Rocky Mountain Locust," *Melanoplus spretus* (Thos.), more has, perhaps, been written than of any other insect on earth, yet it is but one of 207 of its kind which are described at length by Mr. Scudder. The others are scattered far and wide over the continent of North America and the descriptions of the ninety-two species hitherto rightfully known to science were distributed through an almost equal range of literature. No better evidence of the need of the "Revision" is necessary than to know that after a careful examination of nearly 8,000 specimens, 7,000 of which belonged to the single genus Melanoplus, the author has in it reduced forty-seven supposed species to synonyms and has established eighteen new genera and described for the first time 115 species.

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*Proc. U.S. Nat. Mus., XX., 1897, No. 1124, pp. 1-421. Plates I.-XXVI.

With a group whose members are so closely kin as those of the Melanopli it has heretofore been almost an impossibility for the specialist—let alone the tyro—to satisfy his conscience as to the status of a specimen which he might have in hand. The available literature was so scattered and the different authors had seized upon so many different characters as representing what appeared to them the most striking structural features, that the whole mess was worse than a Chinese puzzle. By seizing upon the variations of the abdominal appendages of the male as the most salient features showing specific rank, and by publishing actual drawings of two different views of the male abdomen of each of the 207 species, Mr. Scudder has done much to render possible the ready identification of each species—a task which otherwise would have been very difficult, owing to the size of the group and the close similarity of many of its members. Analytical keys to genera, and to species where the genus is not monotypic are also given, and add much to the value of the work; as does also the full list of localities from which each species has heretofore been taken.

Taking into consideration its size and importance, the defects of the "Revision" are very few. The one thing which the tyro will find most lacking is a glossary of the technical terms. In a work of the kind these are necessarily numerous, and though they may be plain to the author and to specialists, to the beginner they are often extremely confusing. Even a figure of a typical locust with all the parts named would have been a great aid. A tendency to multiply species can here and there be noted, as on p. 138, where *M. bivitattus* is separated from *M. femoratus* only by the color of the hind tibiae, which is an exceedingly variable character.

More might have been added along ecological lines, but this is a work for the future which the student of the group can now take up with renewed energy. For before one can write of a species he must have a name to handle it by; something which in the case of many of the members of this group has heretofore been lacking. Now, by using a little care and accustoming himself to the technical terms, the student can, by the aid of the "Revision," soon bring order out of chaos and label his Melanopli with correctness and despatch. In conclusien, it may be said that any one who will use the work will soon conclude that the aim of the author, "to enlarge and systematize our knowledge of this important group as a basis for future studies," has been well and successfully accomplished.

W. S. B.

A Text-Book of Entomology, including the Anatomy, Physiology, Embryology and Metamorphoses of Insects, for use in agricultural and technical schools and colleges, as well as by the working entomologist. By Alpheus S. Packard, M.D., Ph.D. New York: The Macmillan Company, 66 Fifth avenue. 1898. (Price $4.50.)

The book is primarily divided into three parts. Part I. being devoted to morphology and physiology, Part II. to embryology, and Part III. to metamorphoses. Under these divisions Dr. Packard treats his subject as follows: Position of insects in the animal kingdom. Relation of insects to other arthropoda. Insects (hexapoda). The head and its appendages. The thorax and its appendages. The abdomen and its appendages. The armature of insects. The colors of insects. Muscular system, Nervous system. Sensory organs. Digestive canal and its appendages. Glandular and excretory appendages of the digestive canal. Defensive or repugnatorial scent glands. Alluring or scent glands. Organs of circulation. Blood tissue. Respiratory organs. Organs of reproduction. Development of the egg, larva, pupa and imago. Hypermetamorphism. Summary of the facts and suggestions as to the causes of metamorphism.

The volume contains 729 pages, including a carefully prepared index, 654 figures and numerous valuable bibliographical lists. We certainly have nothing in the way of entomological literature, in this country, that will cover the field of development of insects as will this last work of Dr. Packard. Not only the teacher and student, but the educated men and women of the world at large who may desire to know more of the anatomy,

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physiology and metamorphoses of insects, will find in this work the very aid that is most desired. With this work and some other like Comstock's Manual, any student of ordinary ability can begin at the very foundation of entomology and work his way upward, fully as easily as has heretofore been possible in zoology. The advent of this work certainly marks the trend of entomological studies in America. In future, except in some particular groups, we are to have less species-making and more studies of the development and transformations of those already well known in the adult stage, as well as of their inter-relations with each other and with other organisms about them. We shall not study dried corpses, alone, but life in connection therewith, and the possession of pinned specimens of the adults in our cabinets will only increase our desire to know more of the problems of their existence F. M. W.

HANDBOOK OF INSECTS INJURIOUS TO ORCHARD AND BUSH FRUIT. By Eleanor A. Ormerod. London: Simpkin, Marshall & Co., Sept., 1898. 8 vo., 286 pp.

The excellent work which has been done for economic entomology by Miss Ormerod, particularly in England, but also in many other parts of the world, is well known to every one. Her valuable annual reports are eagerly looked for every year by all interested in the practical application of the study of insects for the prevention of their injuries to crops. We have just received from this talented authoress another evidence of her unselfish labours for the good of her countrymen. The above named volume is in reality a compendium of the original observations made during the last twenty-one years by Miss Ormerod and her correspondents, together with the latest results and the most approved remedies for the various pests of large and small fruits.

As in all former publications bearing Miss Ormerod's name, the arrangement of the subjects, for convenience of reference, the presswork and the general get-up of the volume, bear the stamp of a most careful and tasteful masterhand. The different fruit crops treated of are: Apple, cherry, currant, gooseberry, medlar, nut, pear, plum, quince, raspberry and strawberry. At the end is a list of the fruit crops infested by insects with the names of the insect infestations; the subjects are arranged alphabetically; and after the name of each tree or crop mentioned in the work the names of each of the infestations to which it is liable in England are classified under subordinate headings as Bark, Blossoms, Fruit, Leaves, Shoots, Wood according to the nature of the attack. The insects are given with their scientific and popular name and so far as possible are arranged together as to kinds, as Aphides, Beetles, Moths, etc., with the number of the page of the detailed observation in the volume. In four instances where the pests are causes of much mischief to several kinds of crops, the infestation appears under its own name. These exceptions are Earwig, Red Spider, Root-knot Eelworm and Wasps.

Particular mention must be made of the excellence of the illustrations which seem to be perfect types of what such illustrations should be in works on insects for the use of practical fruitgrowers. J. F.

THE BUTTERFLY BOOK, a popular guide to a knowledge of the Butterflies of North America, By W. J. Holland, D. D., Chancellor of the Western University of Pennsylvania, etc., Pittsburg, Pa. One vol. 4to., pp. 382. [Price $3.00 postage prepaid. Copies may be procured from the Author, or William Briggs, 29-33 Richmond Street, West, Toronto.]

It is with great pleasure that we announce the publication of this beautiful popular book on the Butterflies of North America Hitherto the vast number of young people who begin collecting insects have had their enthusiasm sorely chilled by their inability to find names for their specimens and have soon given up the pursuit in despair. Now, there need be no difficulty as far as the butterflies are concerned. In the handsome volumn before us there are no less than forty-eight beautiful colored plates, produced by a new process from photographic representations of specimens from the Author's cabinets and on them are depicted over a thousand butterflies, belonging to 527 species. The colors are remarkably true to nature and a child should have no difficulty in identifying any specimen that he may capture from the plates alone. In the letter press brief de scriptions are given first of the characteristics of the genus, in all its stages, with a wood cut shewing the neuration, and then of each species, setting forth the colours and markings, size, &c., of the butterfly, the early stages where known and the geographical distribution; references are also given to the works of Edwards, Scudder and other authors, where fuller information can be obtained. As an introduction to the work illustrated chapters describe in a popular and interesting manner, the life-history and anatomy of butterflies, how to capture, prepare and preserve specimens, their classification and the principal books that have been published upon them in North America. Interspersed through the volume are short papers for the most part of an amusing character in which the author varies the monotony of descriptive matter by telling some of his experiences or relating some interesting facts regarding these beautiful creatures. We heartily commend the work to our readers and earnestly hope that it may become widely distributed amongst all lovers of nature throughout North America. C. J. S. B.

WILLIAM HAGUE HARRINGTON, F.R.S.C.

One of the excellent portraits prefixed to this volume is that of Mr. William Hague Harrington, one of the ablest entomologists in Canada. He was born at Sydney, Cape Breton, on the 19th of April, 1852, and received his early education first at a private school and subsequently at the Sydney Academy, where he distinguished himself by close application in all the lines of study, and particularly in mathematics. In 1870 he removed to Ottawa and on the 30th of November of that year was appointed to a clerkship in the Post Office Department, where he has remained ever since, gradually rising until now he is chief clerk in the money order branch. Mr. Harrington has always been an enthusiastic naturalist and in 1879 he joined with his friend, Dr. James Fletcher, in the formation of the Ottawa Field Naturalists' Club, and has continued to take an active interest in it ever since. During the same year he was elected for the first time a member of the Council of the Entomological Society of Ontario, and has continued to hold some office in it ever since; in 1884, 5 and 6 and again in 1892 he was its delegate to the Royal Society of Canada; in 1891 Vice-President and from 1893 to 1895 President of the Society; for some years past he has also been one of the Editing Committee of the *Canadian Entomologist.*

Beginning with the year 1879, he has been a regular contributor to these Annual Reports. Among his more important and valuable papers may be mentioned those on Elateridæ (1879), Rhyncophora—Weevils (1880), Some Fungi-Eaters (1881), Long-stings, House-flies, Chrysomelidæ (1882), Insects affecting Hickory (1883), Saw-flies (1884), Ants, Wasps and Bees (1885), Insects infesting Maple-trees (1886), The nuptials of Thalessa (1887), Insects affecting willows (1889), Hymenoptera Parasitica (1890), Notes on Japanese insects (1891), Uroceridæ (1893), Notes on Canadian Coleoptera (1894), Winter insects from Swamp-moss (1895) Beetles on Beech (1896), and his Presidential Addresses in 1893 and 4. During all these twenty years he has continually furnished papers of a more technical and scientific character to the pages of the *Canadian Entomologist*, and has described a considerable number of new species of Hymenoptera. His work is so thorough and accurate that it has been awarded the highest praise by those competent to judge.

In 1894 Mr. Harrington was elected a Fellow of the Royal Society of Canada. He is now in the full maturity of his powers, and, if his life be spared, we may feel sure that the coming years will continue to bear fruit and that Entomological Science will be enriched by the outpouring of his accumulated stores of learning, experience and observation.

JOHN DEARNESS.

The other portrait at the beginning of this volume is an excellent likeness of Mr. John Dearness, Inspector of Schools for East Middlesex, President of the Ontario Educational Association, member of the Educational Council for the Province, and from 1895 to 1897 President of the Entomological Society of Ontario. Mr. Dearness was born at Hamilton, Ontario, in 1852, his parents having come to Canada from the Orkney Islands. His early years were spent on a farm near St. Marys, where no doubt he imbibed in his youthful days the love of natural history which he has cherished ever since. His primary education was obtained at the local schools, from which he proceeded to the Provincial Normal School; there he greatly distinguished himself throughout the course and left with the highest honors and certificates. He at once began his professional work as the teacher of a cross-roads log schoolhouse in the country, but was soon promoted to be principal of a village school and then of a town school; after a brief period in a high school he was appointed to the important position of inspector in 1874, having gone through all these gradations of scholastic work in the marvellously short space of three years. He has now been performing the duties of an inspector for nearly quarter of a century, and is also Lecturer on Botany and Zoology in the Western University of Ontario at London. He was one of the editors of the series of "Royal Canadian Readers," and in 1896 was appointed a member of the first Educational Council of this Province.

Though his life has been so fully devoted to educational work, Mr. Dearness has yer found time for the practical study of natural science, especially of mycology, and has applied his leisure hours to the formation of a collection of fungi, which is unsurpassed in Canada, containing as it does a very large number of species new to science. For many years he has taken a warm interest in the Entomological Society of Ontario and since 1892 has held an official position upon its Council as Director, Vice-President and President. His addresses when filling the presidential chair have been published in these Annual Reports and must be familiar to our readers; they treat to a large extent, as might naturally be expected, of the educational value of natural history and the methods by which the study of insects can be successfully introduced into country schools. His scientific writings, however, have consisted for the most part of papers read before the Microscopical and Botanical Sections of the Society and have treated of toadstools and mushrooms rather than of bugs and butterflies. Being of the same age as Mr. Harrington and full of health and vigor, we may form similar expectations of his future work in his chosen fields of both science and education. C.J.S.B.

AN ACT TO FURTHER IMPROVE THE SAN JOSE SCALE ACT.

Assented to April 1st, 1899.

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

Short title.

1. This Act may be cited as *The San Jose Scale Amendment Act*.

61 V. c. 33, s. 7 amended.

2. Section 7 of *The San Jose Scale Act, 1898*, is hereby amended by adding the following sub-section:

Destruction of diseased plants.

(*a*) If, in the case of an orchard or collection of plants, the inspector finds scale on plants located in several different parts of the orchard or collection, and decides that it is advisable in the public interest to destroy all the plants in such orchard or in any part or parts thereof and so reports to the Minister, the Minister may direct that an examination or inspection shall be made by an additional inspector, and upon their advice in writing he may direct that all the plants in such orchard or such collection of plants or in such part or parts thereof shall be destroyed without requiring that every plant in the said orchard or collection shall be first examined.

Plants to be fumigated before leaving nursery.

3. The owner or proprietor of any nursery shall not send out or permit any plant to be removed from his nursery without the same being first fumigated by hydrocyanic acid gas in accordance with regulations prescribed by order of the Lieutenant-Governor-in-Council.

Sale of plants before fumigation prohibited

4. No person shall sell or dispose of or offer for sale any plant obtained, taken, or sent out from a nursery unless the said plant has previously been fumigated in accordance with these regulations.

Scale in a nursery—stock not to be removed without leave of Minister.

5. In case the inspector finds scale in any nursery and so reports to the Minister, the Minister may thereupon inform, by writing, the owner or proprietor or manager of said nursery of the existence of scale in his nursery, and the owner or proprietor or manager of said nursery shall not thereafter permit any plant or plants to be removed from the said nursery until he is notified in writing from the Minister that the inspector has reported to the Minister that it is safe in the public interest to permit the said nursery stock to be removed after fumigation.

Act incorporated with 61 V. c. 33

6. This Act and *The San Jose Scale Act, 1898*, shall be read and construed as one Act.

(For the San Jose Scale Act, 1898, see Report of 1897)

REGULATIONS FOR THE FUMIGATION OF NURSERY STOCK.

Toronto, April 7th, 1899.

The following regulations have been prescribed by Order of the Lieutenant-Governor in Council in accordance with the provisions of the *San Jose Scale Amendment Act*, passed April 1st, 1899:

1. Fumigation must be carried on in a box, room, compartment, or house suitable for the purpose, which must be air-tight and capable of rapid ventilation. The owner or proprietor will notify the Minister as soon as preparation for fumigation is complete. The Minister will thereupon order an inspection of the fumigation appliances. No fumigation under the Act is to be carried on until such inspection has been made and a satisfactory report sent to the Minister.

2. The Inspector, after examining and measuring the box or house, or other compartment in which fumigation is to be carried on, will prescribe the amounts of material to be used for every fumigation, and the instructions as to the same must be carefully followed out. The Inspector may, if thought advisable, supply the material for each fumigation in weighed packages.

3. The fumigation house (which shall include all apparatus or appliances used in the fumigation, such as generators, etc.) is to be subject to the orders of the Minister on the recommendation of the Inspector. Subject to the approval of the Inspector the fumigation house may be on other lots than those on which the nursery stock are growing.

4. The fumigation is to be by hydrocyanic acid gas produced according to the instructions of the Inspector and from such formulas as he prescribes for the purpose.

5. The fumigation is to be continued for a period of not less than forty-five minutes. After the expiration of this time or longer, and when fumigation is complete, the house is to be thoroughly ventilated for fifteen minutes at least.

6. No person is to be allowed to enter the fumigating house until after the ventilation period has expired. Entering before may prove injurious, if not fatal, as the gas is a deadly poison.

7. The fumigation of buds and scions may be done in fumigation boxes of not less than thirty cubic feet capacity, the same to be subject to inspection and approval.

8. Immediately after inspection of the fumigation house, the Inspector will report to the Minister, and the Minister or the Inspector will thereupon give permission in writing for the owner or proprietor to begin fumigation.

9. The owner or proprietor of every nursery will attach to every box and to every package of nursery stock a certificate as follows, and he will furnish every purchaser who so desires a copy of the same.

CERTIFICATE OF FUMIGATION.

This is to certify that this package of nursery stock consisting of................

....

....

was properly fumigated on the.........day of............., 1899, in accordance with the regulations laid down by the Ontario Minister of Agriculture. in accordance with 62nd Victoria, chapter 35.

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THIRTIETH ANNUAL REPORT

OF THE

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OF

ONTARIO.

1899.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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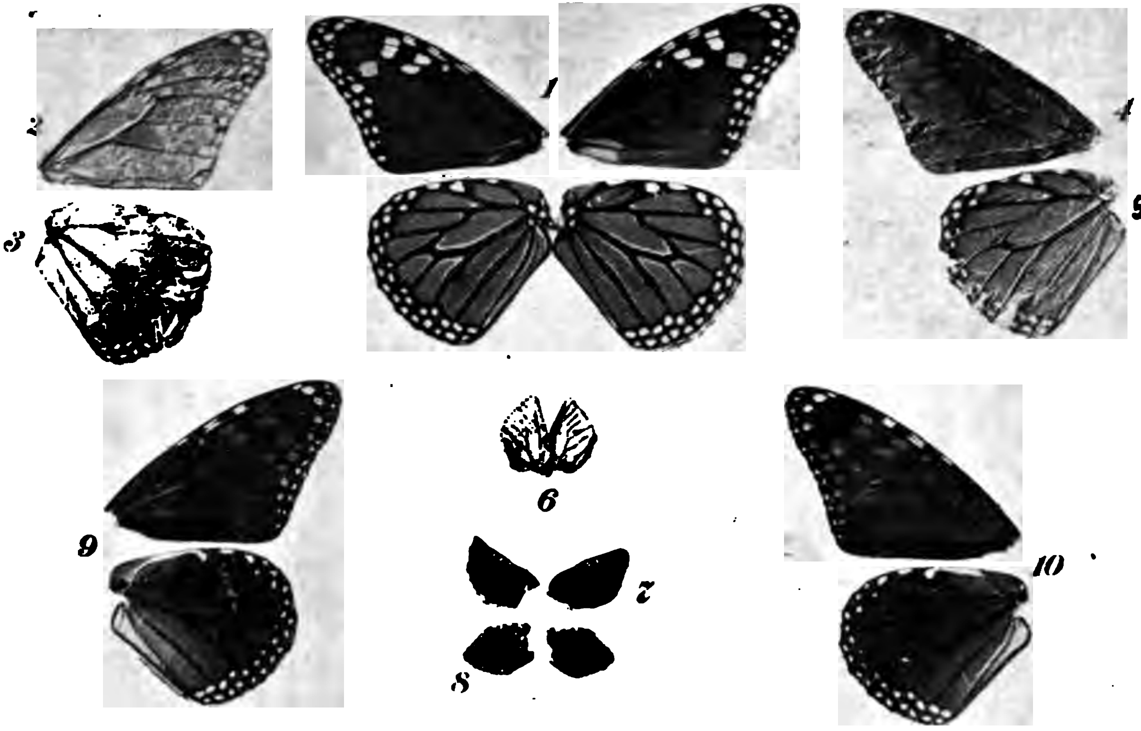
HENRY HERBERT LYMAN, M.A.,
PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1897-1898.



STRUCTURE OF A BUTTERFLY'S WING.

THIRTIETH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1899.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to present herewith the thirtieth annual report of the Entomological Society of Ontario.

The thirty-sixth annual meeting of the Society was held in the City of London on the 11th and 12th of October, 1899, when the officers for the ensuing year were elected and the necessary business of the Society was transacted. The report contains a full account of an important conference upon the San Jose Scale, to which the first afternoon was devoted, the audited statement of the Treasurer, reports of the various branches, sections and officers of the Society, and ot the papers and addresses presented during the meeting.

The Society's monthly magazine, the *Canadian Entomologist*, has been regularly issued and has just completed its thirty-first volume. It continues to maintain its high reputation as a valuable scientific publication and to attract the contributions of the most eminent Entomologists of the day, both here and in other countries.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

LONDON, Ontario.

OFFICERS FOR 1899-1900.

President.—Rev. T. W. Fyles, D.C.L., F.L.S. .... South Quebec.

Vice-President.—Professor Wm. Lochhead, Ontario Agricultural College..... Guelph.

Secretary.—William E. Saunders.. London.

Treasurer.—J. A. Balkwill.. London.

Directors :

Division No. 1.—W. H. Harrington, F.R.S.C .... Ottawa.

" 2.—J. D. Evans .... Trenton.

" 3.—D. G Cox .... Toronto

" 4.—James Johnson .... Bartonville.

" 5.—R. W. Rennie .... London.

Directors ex officio (ex-Presidents of the Society) :

Professor Wm. Saunders, LL.D., F.R.S.C., F.L.S., Director of the Experimental Farms.. Ottawa.

Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C..................... London.

James Fletcher, LL.D., F.R.S.C., F.L.S., Entomologist and Botanist, Experimental Farms .... Ottawa.

John Dearness, I.P.S .... London.

Henry H. Lyman, M.A. .... Montreal.

Director ex-officio (Ontario Agricultural College).—Professor Wm. Lochhead.. Guelph.

Librarian and Curator.—J. Alston Moffat........................ London.

Auditors.—J. H. Bowman and W. H. Hamilton .... London.

Editor of the Canadian Entomologist.—Rev. Dr. Bethune .... London.

Editing Committee.—Dr. J. Fletcher, Ottawa ; H. H. Lyman, Montreal ; J. D. Evans, Trenton ; W. H. Harrington, Ottawa ; Prof Lochhead......... Guelph.

Delegate to the Royal Society.—Rev. Dr. Bethune .... London.

Delegates to the Western Fair.—J. Dearness and Dr. Bethune ..... London.

Committee on Field Days.—Dr. Woolverton, Messrs. Balkwill, Bowman, Elliott, Law, Percival, Rennie and Saunders .... London

Library and Rooms Committee.—Messrs. Balkwill, Bethune, Dearness, Moffat and Saunders .... London.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-sixth annual meeting of the Entomological Society of Ontario was held in the rooms of the Society, Wellington Street, London, on Wednesday and Thursday, October 11th and 12th. The Council met on Wednesday at 11 a.m. for the purpose of preparing its annual report and transacting the ordinary business of the Society. At the request of the President, Mr. Henry H. Lyman, of Montreal, the chair was occupied by the Rev. Dr. Bethune, of London The following additional members were also present: Rev. Dr. Fyles, South Quebec; Dr. James Fletcher, Entomologist and Botanist, and Mr. Arthur Gibson Assistant Entomologist, Experimental Farms, Ottawa; Professor Lochhead, Ontario Agricultural College, Guelph; Messrs. W. E. Saunders, J. A. Balkwill, R. W. Rennie and J. Alston Moffat, London. Letters expressing regret at their inability to attend the meeting were received from Mr. W. H. Harrington, Ottawa; Mr. J. D. Evans, Trenton; Mr. G. M. Stewart, Secretary of the Toronto Branch; and Mr. Dwight Brainerd, Montreal.

The President brought up the subject of members' subscriptions that are in arrears and gave a tabulated statement of those in this position. After some discussion a by-law was adopted in which instructions are given to the Secretary for dealing with all such cases, and if necessary, discontinuing the sending of the Magazine and Report.

Dr. Bethune drew the attention of the Council to the fact that the membership of the Society had so largely increased during the last few years that the number of surplus copies of the *Canadian Entomologist* had become alarmingly small. He presented a tender from the London Printing and Lithographing Company, and it was decided to increase the monthly issue by one hundred copies, beginning with the number for January, 1900.

The report of the Council was then prepared, and after the transaction of some further details of business, the meeting adjourned.

CONFERENCE ON THE SAN JOSE SCALE.

The Society met at 3 o'clock on Wednesday afternoon, October 11th, for the purpose of holding a conference on the all-important subject of San Jose Scale. The following members were present, in addition to those already mentioned: Prof. C. C. James, Deputy Minister of Agriculture for Ontario, Toronto; Inspector G. E. Fisher, Freeman, Ont.; Prof. F. M. Webster, Wooster, Ohio; Messrs. J. Dearness, H. Gould, J. Law, J. S. Pearce, W. Percival, H. S. Saunders, Spencer, Dr. W. J. Stevenson and others. The chair was taken by the President, Mr. Henry H. Lyman, Montreal.

THE CHAIRMAN: I have much pleasure in welcoming you to this 36th annual meeting of the Entomological Society of Ontario. We are particularly fortunate this year in having a number of distinguished entomologists with us. We had hoped to have the pleasure of welcoming the Hon. Mr. Dryden, Minister of Agriculture for Ontario, but unfortunately he has been unable to attend, but he has sent his Deputy, Prof. James, whom we are all very glad to see. We also have Prof. Webster, who has taken the trouble to come from Wooster, Ohio, to be present, as well as Mr. Fisher, Inspector of San Jose Scale for Ontario; Prof. Lochhead, of the Agricultural College, Guelph, and others, so that our meeting ought to be a particularly important and useful one, but as I unfortunately labor under the infirmity of deafness, I will call upon our Vice-President, Rev. Dr. Fyles, of Quebec, to take the chair and preside over the meeting.

Rev. Dr. Fyles: I am very sorry that our worthy chairman is afflicted with deafness. I am very sorry on my own account. I would wish to express the very great pleasure I feel on seeing so large a gathering to-day, and I may say a gathering of distinguished men. We have a very important subject to consider—that of the San Jose Scale insect, which is doing so much damage in the United States and in Canada.

I am happy to say we have an authority on this destructive insect in Prof. Webster, from Ohio, who will tell us about the pest and his experience in connection with it. We have also our own Dominion Entomologist, Prof. Fletcher, who has given much attention to the scale, and I trust we shall all benefit by the opinions that these gentlemen can give us. There are others who will be able to speak upon the subject under consideration, and I will now in the first place call upon Mr. Dearness to commence the discussion on this interesting subject.

Mr Dearness: Mr. President and gentlemen. Yesterday evening I was asked to open the discussion on the San Jose Scale insect. I was aware that my name was on the programme, but I did not expect to have the honor of opening the discussion. I have hastily jotted down some notes by way of introduction.

Nineteen years ago Prof. Comstock published descriptions of a number of Coccids in the Genus Aspidiotus, one of which he very appropriately named *A. perniciosus.* The first American home of this scale is supposed to have been in the San Jose Valley, California, and hence the popular name of the species. No one knows how long it had inhabited the fruit trees in that district before Prof. Comstock labelled it. One doubtful theory is that it had been introduced ten years before that time from Chili. It is pretty well settled that it is now about thirty years since its effects on deciduous fruit trees were first observed in California. Singularly enough according to Prof. Comstock's information the peach and apricot were exempt from its attacks. In Canada and the United States, if it thrives particularly well on any kind of tree, it is on the peach. Earnest efforts have been made to fix the date of its introduction to the Eastern United States. It seems established that the first extensive distribution of it was by the Californian nursery stock sent out by two firms in New Jersey twelve years ago.

This summer an unsuccessful attempt was made to fix the date of its importation to Ontario. It may be that some of that 1887 New Jersey stock found its way here. A trustworthy and observant fruit grower, Mr. John Vanhorn, of Chatham, testified this summer that he detected this scale in his orchard six years ago, the suggestion to look for it having come from a New Jersey nursery firm—the Parry Brothers—with whom he had had dealings. It is not out of the range of probability that it was introduced into the southwestern part of Kent county ten or twelve years ago.

From the scientific point of view the *Coccidae* are an interesting and attractive family of insects. It is also a large family. Although it cannot be said to be well worked up, Prof. Cockerell's check-list published three years ago gives 770 species, to which his supplementary list, published this year, adds 322 species. More than a third of these additions are in the section *Diaspinae*, to which the San Jose Scale belongs.

Some of these may yet, when they go abroad, rival the San Jose in destructiveness. Several of them are capable, and guilty too, of killing the plant upon which they feed, but at present and for the past five years the San Jose overshadows all its relations in economic interest on account of its destructiveness, The sagacious Comstock nineteen years ago declared it as his belief that it is the most pernicious scale insect in the country.

What makes it so pernicious ? Several other species are as strongly armored. Its larvæ are longer exposed than many others. It does not seem to set up a morbid condition of the tissue of the plant on which it feeds ; like its congeners, it simply sucks the sap of its host. (It is true that its presence it characterized in some kinds of wood by a reddening of the subcuticular and cambium layers, but there is no distortion of the tissue as in the case of tissue affected by black-knot.) A gravid female does not contain nearly so many ova as a *Mytilaspis.* As a rule an insect that winters in the egg state, as the oyster- shell bark-louse does, is safer than one that hibernates. What then gives the San Jose Scale its pre-eminence among its brethren as a plant destroyer?

First, it is the difference between addition and multiplication. A single brood of 600 is left far behind by a three or four-generation multiplication of even 50 or 60 In Ontario the over-wintered San Jose females begin bringing forth their young about the 20th of June. If by the 15th of July each of these over-wintered ones has produced 30 females, these are by the the latter part of August ready to produce say 50 each (the later mid-summer broods are said to number 200 to 300 females from each mother) giving a total of 1,500, and each of these 1,500 by the early part of October is multiplying by 50, totalling for the single season, in Ontario, a progeny of 75,000 females from each individual female that survived the winter.

It is probable with us that there are three full generations in a year. The possible ratio of multiplication is probably nearer 100 than 50. (It is said to be between 200 and 300 in the latitude of Washington). A ratio of 100 for three generations would give a total of a million. On trees in certain conditions and of varieties that have resistant bark, probably only a small proportion effect a connection with the sap channels necessary for them to complete their life cycle. There is pretty good evidence that a susceptible young tree may be overrun and literally sucked to death in three years. On the other hand, the increase of the insect on trees of a susceptible kind has in some cases been very slow. Mr. Honner, Amherstburg, testified that on a young peach tree in his orchard the scale had been most certainly established three years and yet in that time it had spread over but a small part of the tree.

Secondly, the comparative activity of the larvae and their plumpness at birth enables them to scurry around a considerable distance and to subsist a relatively long time before they perish for lack of food.

Third, its lack of fastidiousness in the flavor of its nourishment. Trees, shrubs, herbs, foliage, fruit and roots are neither common nor unclean to it. Mr. John Gordon, of Guilds, whose story of his efforts to save his orchard from the officers of the law, was truly pathetic, has spent time and effort without stint in studying and experimenting upon the insects in his neighbors' orchards since his own was burned. He showed Mr. J. H. Smith, B.A., and me, examples of the settlement of the insect and the secretion of its scale on fruit of watermelon, root of carrot, fruit of squash, leaves of poison ivy, garden phlox, high-brush cranberry, and hemerocallis. Besides some of the above he had artificially inoculated mulberry, basswood, blue beech, red beech, ironwood and elm. We found on September fourth and fifth, breeding females on hemp, pitch forks, rhubarb, burdock, horse-radish, erect door weed, oriental polygonum, hedge mustard, turtle-head, nettle, touch-me-not, potato, white ash, willow, nine-bark, rose, elm, basswood, currant.

The almost continuous running of the larvae, owing to the fact that they are produced singly over a period of several days, offers the means of their distribution by nesting birds, strong winds, horses and workmen engaged in the orchard, and fruit harvesters.

The desirability, nay the necessity, of checking, eradicating or controlling an insect so fecund, so omnivorous and so destructive as the San Jose Scale is at once impressed by a knowledge of its habits and capabilities. The usual restriction of animal life to its peculiar faunal zone makes some biologists hope that in our latitude this insect, even if let alone, could not become so destructive as in the latitude of Maryland. The extreme severity of the winter of 1899 proves that prolonged zero temperature, while it may weaken and check it, will not eradicate it. Its allies on our fruit trees are usually held in check by parasitic insects. In the trip just referred to, Mr, J. H. Smith and I were shown two trees the worst infested I ever saw with *Chionaspis*. Here and there were groups of the spinulous sloughs of *Chilocorus*. The owner informed us that there had been a great many more of those, but he had brushed them off and killed them. As frequently happens in insect fighting, he was spending his efforts in killing his allies. In one sample of Putnam's scale that I found on hickory, nearly every shield was perforated and its contents devoured by some insect.

I have not seen anything like this degree of havoc by parasites among the San Jose scale, yet it doubtless has its foes among both insects and fungi. Prof. Forbes, State Entomologist of Illinois, reports in Bulletin No. 56, that he has discovered in *Sphaerostilbe coccophila*, Tul, found by Prof. Rolfs on the oak scale in Florida, an efficient fungous disease for the San Jose species. Most of the bulletins report that a little coccinelid beetle, *Pentilia mesilla*, preys actively on the San Jose Scale, and also that in some localities the twice stabbed lady-bird, *Chilocorus bivulnerus* has literally cleared the tree of the scale. Certain species of mites also prey upon it. On specimens collected in South Kent, I found a mite apparently feeding on the scale which Mr. Marlatt pronounces a species of Rhyncholophus and another much more common not yet determined.*

Mr. John Gordon, above cited, has been experimenting with the application of hot steam and a small proportion of coal oil. He is making use of one of his neighbor's trees that was nearly killed with the scale as an example of this method of treatment. (Specimen cuttings from this tree were exhibited. Branches cut off before the treatment still had numerous young scale larvæ running over them; while upon cuttings taken from the treated branches no surely living scale could be found.) Mr. Thonger assured me that Dr. Fletcher had reported 97 per cent. of the scale dead on the samples taken from the trees he had treated with a mechanical mixture of coal oil and water. The machine mixes the oil and water in definite proportions at the nozzles and projects the mixture as an "atomized" spray. Mr. Thonger seems to have confidence that if he had been allowed to repeat his spraying with the coal-oil mixture he could have eradicated the scale from his orchard.

Up to the present time the most successful and satisfactory method of remedial treatment is the fish-oil and potash soap solution. This is a soft-soap made with a special fish-oil and strong caustic potash, dissolved in water in the proportion of two pounds to the gallon. Accounts of the demonstration of the success of this kind of treatment on a large scale as made at Catawba Island, Ohio, under the direction of Prof. F. M. Webster and Mr. Willis H. Owen have been published and extensively circulated.

As Prof. Webster is here to-day I will leave it to him to describe the treatment and its results. The potash soap treatment was found to affect the trees so favorably there that growers who had not the scale in their orchards have used it generously. Mr. Owen said that over 17 tons were used last winter on an area considerably less than 1,000 acres. Mr. J. W. Gamble, President of the Ottawa, Ohio, Horticultural Society, for his annual address, read a paper entitled "The San Jose Scale as a Blessing in Disguise." His argument was that the scale had indirectly led the growers to discover the value of the soap as a general cleaner-up and fertilizer of their trees, and on peach-trees it had checked the destructive leaf-curl.

When the scale was first discovered in Ontario, the people thought it was confined to two or three situations and within narrow limits at these places. Had that been the case no wiser course could be taken than to cut down and burn the trees. It soon became evident that it was much more widely established than at first suspected. The axe and fire is a primitive method of treatment for insects. Here is one that lives on the surface and has not the power, save in a restricted degree for a short period, of moving its position. Surely science will not remain helpless and useless to kill that exposed insect and save the valuable tree upon which it feeds. In several instances more money has been spent in going over a tree with lenses to discover whether the scale was on it than it would have cost to spray it thoroughly. Drenching with the spraying machine will reach the parts that the lens will miss. The axe and fire method is dependent on the discovery of the insect and discovery is not always possible. Several other species of scale are liable to be mistaken for the San Jose one. By the fire method mistakes are irremediable; by the spraying method no harm comes to the tree though it be drenched with soap suds for harboring one of the native species of scale.

---

* Respecting the last, Dr. Howard wrote on the 23rd Oct., "I have to inform you that your scale mite has been examined by Mr. Banks, and he identifies it, with some little doubt, as *Hemisarcoptes coccisugus*, Lign. If not this species it is a closely allied one and belongs to the family Canestrinidæ. The species is the only one known in the genus, and is a parasite of Coccidæ, having been found in this country on the oyster-shell bark-louse, and in Europe on other scale insects.

The Chairman: I am sure I voice the feelings of the meeting when I say we are very much obliged to Mr. Dearness for his carefully prepared and interesting notes. This Scale Insect is a most disobliging insect. I think with such a choice of fruit trees it should leave other trees alone.

Mr. Fisher: What progress did this scale appear to be making on those trees, other than fruit trees, which had been artifically inoculated?

Mr. Dearness: Those that had been artifically inoculated had not had time to mature when I saw them. They were only in the stage of brown and yellowish round scales.

Mr. Fisher: Have you ever found scales on trees that had not been inoculated that appeared to be doing well?

Mr. Dearness: On the Spiraea we found it doing well.

Mr. Fisher: Is that a forest tree?

Mr Dearness: That is a shrub; and we found it growing on the elm and basswood but not doing so well as on the fruit tree.

Mr. Fisher: In this connection I understood there was a feeling that the Scale would flourish on the shade trees in the city of St. Catharines, and we made a very careful examination of the shade trees last year. We spent quite a number of afternoons inspecting the trees, with the result that we could not find any trace of the San Jose Scale on these trees notwithstanding that the neighbouring gardens were very badly infested. This year I thought it only fair there should be a further examination made as we found the Scale spreading to much more distant points, and yesterday we made a careful examination of Rodman Street and Geneva Street, with the result that we found no Scale whatever on any of the hardwood trees. The trees along these streets are hard maple and soft maple and elm and horse-chestnut.

The Chairman: That would seem to say that the insect preferred fruit trees.

Dr. Fletcher: Are there any fruit trees infested by the Scale growing in the neighborhood of these trees?

Mr. Fisher: There are currant bushes that are rotten with the Scale.

Mr. Dearness: In reference to that allow me to point out that Prof. Comstock speaks of peach being excepted and apricot being excepted and certain kinds of cherry trees being exempt. We found elm and maple surrounded by badly infested trees exempt. These infested trees have been infested by wind, or men working among them, or by the harvesters. The insect cannot make its connection on the trunk of a tree like the hard maple, but if these insects were brought by these agencies and put up on the top of a forest tree, I cannot see why they would not grow there.

Because a fruit tree is exempt while others surrounding it are affected does not prove that the scale won't live on it. You will find in an orchard three or four trees badly infested and other trees that you cannot see any on right in the immediate vicinity. Here is a branch of a willow that is badly infested and the whole tree was infested throughout.

Dr. Fletcher: There is no question about its attacking the elm. It is one of the characteristics of the Coccidae that you will find a single tree very badly infested, and then touching that tree will be others perfectly exempt. That simply shows that a tree in a weakened state is more apt to be attacked than in a vigorous state.

Mr. Fisher: I never found elm infested.

Mr. Dearness: Here is an elm that is infested (shewing a specimen).

Dr. Fletcher: Of course it is a new importation into Canada, and it is more likely to attack the same kind of trees that it has been feeding on, but at the same time we cannot argue that it will not work on other trees. In the first year of the introduction of the San Jose Scale into the Niagara district we could not find it on peach trees; it was on pear and plum only; but the second year it was all through the peaches. In Kingsville likewise it was on pears and plums first, and the next year we found it on the peaches.

What is the object of this discussion: is it not to bring out the known state of affairs in Canada in connection with this insect, its distribution, abundance, etc.?

THE CHAIRMAN: Yes, and then what can be done to remedy that state of things.

PROFESSOR WEBSTER, Wooster, Ohio: I really do not know whether or not I can tell you anything new that will help you in your troubles. I have had experience enough with the San José Scale, goodness knows, but there are a lot of things yet to learn that I do not understand, and I should like to have it understood that I am not going to explain all San José Scale puzzles. I have a whole note book full of them that I cannot yet explain. You speak of the introduction of the San José Scale into Canada, but in another paper I will give you, I think that I can show you that it is not absolutely necessary to trace all introductions back to the two New Jersey nurseries. We had a nursery in Ohio of which I have never been able to find sufficient proof to convince me that there was not an introduction into that nursery before it could have been gotten from New Jersey. I cannot understand how the premises could be so thoroughly infested since that time. I have no proof of course but it has been a marvel to me and I do not yet understand it. I think I can give you some information at least that will point to a possible introduction in the east, independent of these two nurseries. In regard to the scale becoming established I will give you an illustration of a puzzle that came up. I wanted to get them into the insectary so that we could watch them closely. I planted some fruit trees in the insectary, not wishing to place the scale on those outside. I tried for two years to get the scale started in the insectary on those fruit trees, and it was only after two years that I succeeded. Three times I got limbs from infested trees outside, brought them in, tied them to the trees but we could not get one of those rascals to get off the old original limb and settle down where any sensible insect would. Another instance: I know of a row of peach trees where the pits were said to have been planted where the trees were growing, and about two and a half feet upward from the surface of the ground the trunks were totally crusted with scale. After a half hour's search I could not find a single scale on the limbs, and an apple whose limbs intermingled with those of the peach had no scales on it whatever. There were no infested trees near by.

As to natural enemies I have not found any in Ohio that give any hope whatever of any immediate relief. I suppose that in the course of years our native insects will prey upon it but they have yet to cultivate an appetite for it, just as we do for our oysters. I noticed the little black *Pentilla* very abundant in the orchards of northern Ohio last fall, but this spring I found that they had evidently been killed off by the winter just about in proportion as the scale was destroyed, so that the problem is in precisely the same position that it was before. This year there are not more than half as many of the natural enemies as there were last year. Speaking of the elm, if is is not burnt I can send you a section of an elm tree that is as badly infested as any fruit tree I ever saw, but I have not generally found it as abundant on the elm as on the fruit trees.

MR. FISHER: Do you find it often on the elm?

PROFESSOR WEBSTER: I have found it bad in the nurseries and have found it in a small orchard growing up in the midst of the woods, where the young elm shoots were growing up from the old roots, these shoots being pretty badly infested with it. Wherever I have found elms intermingled with infested fruit trees, I have found the elm more or less infected but not always as badly. The first experience I had with the scale was in December 1894, when it was sent me from an orchard in southern Ohio, and the trees were very easily traced back to the nursery where they were grown. The first infested trees sent out from that nursery were not peach, because the peach stock was grown in another part of the premises and they were not infested, the points of infestation being near where the apple, plum and pear stock were grown, but since that we found it upon the peach. I did not know what was best to do at the time and the owner was in a desperate state of mind and asked me if he could put kerosene on the trees. I told him he might if he wanted to but I thought he would kill the scale and presumed he would kill the trees also. He used kerosene thoroughly and, fearing that he had not been thorough enough, he used it a second time and I told him he had probably fixed the scale and his orchard too. I was surprised on learning that he had not killed his orchard, and the fact gave me hope that we might expect something from the application of pure kerosene. Some other experiments were made that did not turn out as favorably, as we killed the trees and since that I have been wondering why it would work satisfactorily one time and the opposite way at another. My assistant has applied kerosene to the same kind of trees, using the same brand of kerosene, and in one case it caused no injury and in the other case it killed the trees.

The Chairman: Did he kill the insects in both cases?

Professor Webster: Yes, he killed those that he reached. In some cases there would be individuals that were behind a bud, or behind some loose bark where he could not reach them, and I should not expect that a single application of anything, except fire, would kill every insect on a tree. Later, while dealing with the Catawba Island outbreak, we heard considerable about whale oil soap, and we used both kerosene and whale oil soap. The fruit commissioners got together and divided the trees into three grades. The first, comprising such as seemed to be too far gone to do anything with whatever, were cut down and burned. Then there were quite a number where it seemed as though, if we could destroy the scale at once, there might perhaps be a chance to save them, and I told these people that I would not be responsible for the results, but they might try kerosene: if there was any benefit to be gained they would get it, and that they could not do any more than destroy the trees and these would have to be destroyed anyway. In some cases the kerosene resulted fatally and, of course, that added to the number of trees that were destroyed. The other grade were such as were not so badly infested but what it seemed they might be saved, and on these they used whale oil soap.

Now, they have not exterminated the San José Scale on Catawba Island by any means. They have in this way simply got it under control by the use of whale oil soap. If the people persist in a proper way I think it can be exterminated. As it is they have simply reduced the pest to a point where they can control it; but just as sure as they give that over for a single year it will come to the front, and I think if they were to allow their premises to go two or three years there would be a great many trees that would not be worth saving.

Prof. James: Has the fact of its being an island helped very much?

Prof. Webster: I do not think so. The place is called an island by courtesy. It is only separated from the mainland by a swamp. There is really no bed of water between the island and the mainland. I do not think that has any effect at all. I do not see why they should have better results there than any place else if the same means were used. We have no law in Ohio that is good for anything. We have a law, relative to the suppression of peach yellow and black knot, and our Legislators thought it would be better to patch up the old law, and sandwich in a paragraph relating to the San Jose Scale, than it would be to make an entirely new one, and the consequence is we have a patched-up law that is worthless, because no one understands or dares to attempt to enforce it.

All that has been done since 1894 has been by persuasion on my part, the only authority I have being that of referee. If there is a question between the Fruit Commissioners and the owners of an orchard, it has to come to me, and as my decision is final, there do not very many of these questions come before me. That is the reason why they had such good results out at Catawba Island. Mr. Owen was sharp enough to throw the whole responsibility on me, and he would tell these people that my decision was final and that would settle it. What has been done there, has been done by the persistent use of fire and whale oil soap, and appealing to the people to do the same thing and at the proper time. There is as much in that, or more than in anything else. It is not so much what the scale will do as we know that pretty well, but what the people will do with the scale.

I believe it can be exterminated, but it will take a great many years, and the control of treatment must be in the hands of some one man, and that man must not have a great many neighbors.

Prof. James: What would you have that man do?

Prof. Webster: I would put the whole matter of treatment and everything connected with it into his hands. If in some cases he saw fit to let the owner do the work, well and good, but he and not the owner should be held responsible to the Government.

The Chairman: I suppose you mean he would have to be protected from his neighbors.

Professor Webster: I guess if you would give him authority enough he would protect himself. If people come to learn that he can do the work better and cheaper than they can, there will be no trouble.

Prof James: You would not leave the treatment to the owners?

Professor Webster: I would leave no treatment to anybody except the one person whom you make responsible to your Minister for its being done properly, at the proper time, and if it is not, hold him alone responsible for it. If you put this work in the hands of the public you will get nothing done, even among very intelligent people We had an experience of that last week in fumigating nursery stock. A nurseryman wanted me to let my assistant go down and fumigate his stock. I told him if they would get everything ready, so that my assistant could get on with the work just as soon as he reached his destination, and go away just as soon as the work was done, I would let him go. He went down there, and he said they had a fumigating house that he could drive cats through. It was not at all adapted to the use for which it was intended and he compelled them to line it, and then they declared that it was absolutely tight, but after he started work and went outside he said the odor of the gas was very strong and they had to line it again. That shows how far you can trust people who are supposed to be rather above the average farmer and fruit-grower in intelligence. You must have some one person who does understand and make him responsible, and then see that every man has the proper measures and that they are applied in the proper way and at the proper time.

Prof. James: Have you any regulation whereby you can decide whether a tree ought to be taken out or fumigated?

Professor Webster: No sir, you must see the tree yourself. There are some varieties of trees that are almost worthless, and that would make a great difference. There are so many of these matters to look into that your chief officer must be on the ground and understand the situation in order to be able to decide. I do not know how it is in Canada, but in the United States there are some trees that were not worth ten cents before the scale came on them, but became suddenly valuable about the time they were to be destroyed.

As to the time, I have never found that we could do much except during the winter and spring. Summer treatment would only apply to the young scale. I do not believe you could apply anything to the trees, in the summer, that will destroy very many more than the young, without injury to the tree. During the winter season, when the foliage is off, of course, you have a much better opportunity of reaching the trees and the limbs, and with the exception of the peach you can use a much stronger mixture. You can then use a mixture that will penetrate and kill the scale. With the peach you can do this also, but it will destroy the fruit buds unless it is applied just when the buds are putting out in spring. There is a time just when the fruit buds are being put out when we can use the ordinary mixture, two pounds of whale oil soap to a gallon of water, without injury to the fruit buds.

I urged Mr. Owen to go to work and manufacture a soap that would be of a uniform grade. The great difficulty has been that we would use a certain brand of soap and it would seem to be thoroughly effective and not injurious, and I would recommend that same brand for some one to use and they would get entirely different results, and these brands do not, as a rule, analyze alike; so I urged Mr. Owen to manufacture a soap that we knew would be of a uniform strength, and he has done so. I do not know that it varies particularly from Mr. Good's soap, only I believe it is more reliable, that is all.

PROF. JAMES: Has all the treatment on Catawba Island been under your directions?

PROF. WEBSTER: Not lately; I have not had very much to do with it the last year. The most that has been done the last year has been done independently by individuals. Of course, they brought a good deal of pressure to bear on those that were delinquent. I have had very little to with it after the scale was once gotten under control.

THE CHAIRMAN: It seems to me that we have come to these particulars through the able address of Prof. Webster. That the right remedy is whale oil soap, that should be applied in the winter and in the case of the peach when the tree is about to bud. What is necessary is a strong pull and a long pull and a pull altogether, or else that some one, with considerable powers of coercion, should be appointed to see that the fruit-growers do their duty.

MR FISHER: I would like to ask Prof. Webster what additional benefits seem to result from the use of whale oil soap for the destruction of the scale.

PROF. WEBSTER: It is claimed, and I think with reason, that it acts as a fertilizer, and I would simply say that, to my certain knowledge, it has done so in some of our nurseries. It has been used a good deal stronger than was necessary in some of our nurseries, and when I asked why it was being used so strong the reply was that the stock that had been treated was a great deal more thrifty and in a great deal better condition than the untreated stock, and it was a question if it did not pay in that respect. I think as a fertilizer it has a very good effect. Some of our nurserymen are applying it to destroy the apple leaf aphis.

DR. FLETCHER: That is the potash?

PROF. WEBSTER: Yes, the potash, and, possibly, the fish oil also. Fish is a good fertilizer. I do not know to what extent it is a fungicide, but I do know that trees that were treated in the spring were exempt from the peach leaf curl, where the same variety, untreated, in the same row in the same orchard, was badly affected and the fruit nearly all destroyed. So, as a fungicide, to that extent it is certainly a very great benefit. This, and the fertilizing effects, are two very great benefits that would be gained by its use.

MR. DEARNESS: What about insect eggs on the trees?

PROF WEBSTER: That I do not know. It has been so stated, and perhaps it will prove true, that fumigation will destroy insect eggs. We have made no fumigation in orchards, but the longer we use hydrocyanic acid gas in treating nursery stock, the more we are convinced of its utility. With a proper fumigating house, and the fumigating done properly, we have never yet had a single living scale pass through the process alive.

DR. FLETCHER: How long do you keep the plants in?

PROF. WEBSTER: About 45 minutes. In regard to effect of kerosene, there was sent to me, I think two or three years ago, a limb that was cut off from a tree infested with the oyster-shell bark-louse. The section sent was said to have been drenched with coal oil, but not only did the young bark lice hatch and live, but we actually got parasites from that scale after it had been treated with the kerosene.

DR. FLETCHER: Perhaps Prof. James can tell us if there are any fertilizing effects from the whale oil soap?

PROF. JAMES: Certainly not in the oil, but potash certainly would be very beneficial.

DR. FLETCHER: Is it not an expensive way of applying potash?

PROF. JAMES: Some contend it is not expensive. Last week, when I was talking to a lady who took over an old orchard near Philadelphia, she told me she started washing the trees with potash solution in order to clean the trees, and she said that the old trees that had not been bearing fruit for years commenced to bear. They seemed to renew their youth, and she said she thought it was a more effective way of applying potash to the orchard than by putting it on the ground.

Mr Dearness: There is one point that is of importance, and that is as to the time it injures the peach buds. It does not injure the buds of other fruit excepting peach.

Prof. Webster: Not so far as we have learned. There is a possibility of a similar effect on some varieties of pear.

Dr. Fletcher: It is far better to do the spraying in the spring. One of the great defects in using soap is the want of uniformity. It is simply a matter of accuracy in making it, and the soap that Prof. Webster has used is practically the same potash soap made in an accurate way, so that you can look for the same results every time.

Prof. Webster: I want to ask Prof. James if there is any way that a series of experiments could be carried out whereby we could get some definite idea, or some more exact idea, of the fertilizing value of soaps made of a certain strength.

Prof. James: That is a very difficult matter. Analyses of soils are not very satisfactory, and you are experimenting with a living plant, which apart from the experiment might, or might not, produce. It is different from feeding an animal. Trees vary so much in their production, you might take a row of trees and treat them in different ways, but you are never perfectly sure.

A Member: I notified Mr. John McMechan, who was Secretary of this Society some years ago, and who is a soap manufacturer, to be present here to-day, and I also asked Mr. Heard, who manufactures spray pumps, to be present, but neither gentleman is here. I thought they might have been of some benefit to the Society, or we might have benefitted them in the manufacture of their products.

Prof. Lochhead: I had the honor of attending the Commissioners during their trip to the west this summer. I was not able to be with them when they went to the Niagara District, consequently I cannot speak for that district. We saw in the western part, especially around Guilds, south of Blenheim, some effects of the San Jose Scale in several orchards. I think that even the most sanguine believer in the non-destructiveness of the San Jose Scale could come to no other conclusion but that it was a scale that was very destructive if left alone. Apparently the scale was first introduced into the Guilds District, in Mr. Warner's orchard, about six years ago, and from what I can gather, the attention of the neighborhood and of Mr. Warner himself was called to the death of some of his trees. From that orchard the scale has spread to other orchards, so that one of the most important conclusions we must come to is that the scale is extremely destructive if left to itself. Mr. Dearness has just given us very many instances of the destructiveness of the scale, and it lies with us to impress that fact upon the orchard-men of the Province. In the Kingsville District we saw one orchard, Mrs. Pulling's, originally one of the J. D. Wigle orchards, which was in a very bad condition. I did not see any dead trees, but the trees were in a bad condition. At J. D. Wigle's the scale had broken out in two or three localities; many of the trees that had originally been set out had died, and their places had been filled with fresh nursery stock. This nursery stock had not been fumigated, and consequently the infestation spread from several centres. Now as to the orchard to which Professor Dearness alludes, Mr. Honor's orchard, near Amherstburg, I may say that we were driven to the orchard one fine morning, and that we a saw a splendid object lesson on the effects of whale-oil treatment in an orchard infested with the oyster-shell bark-louse. The trees were large, and any observer could have told at once that they had once been in a pitiable state. I do not know whether Mr. Honor had scraped the bark-lice off or not, but undoubtedly the trees were in a good, healthy, thrifty condition at the time of our visit, and the old bark was sloughing off as if from old wounds. As a matter of fact, the trees had been almost bark-bound before. The recovery of the trees was not due simply to the death of the oyster-shell bark-lice, but it may be partly attributed to the removal of fungi and lichens that incrusted the bark, for I think very serious injury will be done to trees if lichens are allowed to incrust the bark. If the pores of the bark are stopped up, free interchange of gases is prevented, and partial suffocation takes place. The whale-oil soap solution also softens the bark so that it can yield freely to the growth of the tissues within

After this I had the pleasure of going down to Catawba Island in Ohio. There I saw another splendid object lesson in the recovery of that peach district from the ravages of the San Jose Scale. There are three thousand acres in that island—almost one continuous peach orchard, so that there was no more favorable spot for the spread of the scale. At the begining of the experiments the owners had taken out, near the centre of the district, about three thousand trees before they began to try this whale-oil soap experiment. Through the carefulness, persuasiveness and persistency of Mr. Owen, one of Prof. Webster's pupils, the fruit-men in that district were forced, in spite of themselves, to spray.

DR FLETCHER: How?

PROF. LOCHHEAD: Some of them did not believe in the soap treatment the first season, but when they saw the improvement in the condition of their neighbors' trees they sprayed the next year. Some of these men, when they saw the great improvement that had been done, said that the San Jose Scale had been a blessing in disguise. I need not speak further along this line, but shall briefly state four very important conclusions that I have been forced to draw from the work of this San Jose Scale Commission.

First. The scale cannot be exterminated from the orchards of Ontario by the efforts of either Government or people.

Second. Any radical method that aims at extermination should be discontinued. I mean by radical method the destruction of every tree that is infested.

Third. From our experience in Ontario, and what I saw in Maryland in the spring, I conclude that the scale is not quite so destructive in Ontario as it is in Maryland. We have not had it so long here as the orchardists of Maryland have had it. We have had it in Ontario seven or eight years, and although there has been quite a number of trees killed, not more than one or two whole orchards have been killed outright; while in Maryland one hundred acre, and two hundred acre, and three hundred acre peach orchards have been killed outright. At present we are not in a position to say whether the scale will act in that way here or not, but from what we saw in Kingsville, and from what has been seen in some other parts, it is possible it may become as destructive. I am inclined to believe that the climatic conditions will reduce to some extent the full reproductive capacity of the scale. I do not think it is possible that the scale will develope as rapidly in this Ontario climate as it will in the south in Maryland.

MR. DEARNESS: It is likely to have one generation less.

PROF. LOCHHEAD: There is one peculiar feature which inspectors have observed, and it is this, that the scale seems to gather force for two or three years without spreading, and then all at once, like a plague, it breaks out and spreads rapidly.

Fourth. The fourth conclusion is, that the scale can be held in check by the proper soap solution properly administered. I need not rehearse what Prof. Webster has said. He does not believe in letting the orchard men do this; it must be done by a corps of men employed by a Government Superintendent appointed for carrying on this work. Prof. Webster has given plenty of evidence of carelessness on the part of orchardmen, and the Ontario orchardmen are no exception to the Ohio men in this respect. I must repeat that the scale is a most pernicious one, and to say that it is no worse than the oyster shell bark-louse, or some other pests, is an absurd position to take. Its life-history and powers of reproduction are altogether different from the other pests. It is true that the San Jose Scale is confined to the plums, pears, peaches and apples, but it has the power of reproducing on other plants, so that I cannot emphasize too strongly the fact that this scale is a most pernicious one; and I do not think we should try to give out to the public that it is a pest at all overestimated. We must maintain emphatically that it has not been overestimated if we want to preserve the orchards. The scale is undoubtedly taking to our Province kindly. We find it in sections in the Lake Erie district; how far north of that district there has been no chance to determine. It has also been found at Belleville, and a few miles back of Belleville. Belleville has a far colder climate than this district.

This Society should do all in its power to inform the public with regard to the presence of this pest, and I would suggest that every public school inspector in the province should be supplied with some good samples of the scale. This action would be safe, because the San Jose Scales soon die, and are perfectly harmless on a twig which has been cut away from the infested tree. Samples should be given to every school inspector so that he could leave them with the teachers, and give them an object lesson on the scale whenever opportunity offered itself. The teachers could ask the parents to call at the school and see the scale, and in this manner the public would be informed generally as to its appearance.

The Government has to rely upon the co-operation of the orchardmen themselves for future action against the scale, and when they find that no radical method of uprooting trees or burning them down is going to be adopted by the Government, they will come forward readily and report the presence of scale to the proper authorities. It would not be difficult for Mr. Fisher to cut down a badly infested tree and cut it up into little pieces, so that thousands of these could be distributed to the schools of the province. Even if the orchardmen find something that was not the San Jose Scale, let them inform the proper authorities and get information on the subject.

Prof. Lochhead then read the following:

NOTES ON THE ECONOMIC ASPECT OF THE SAN JOSE SCALE AND ITS ALLIES.

The past year, 1899, has been a very eventful one in the history of Economic Entomology in Ontario. Early in April the Legislature passed the Fumigation Act, which compelled all nursery stock, with a few exceptions, to be fumigated with Hydrocyanic Acid Gas. To carry out this process of fumigation special air-tight sheds and buildings had to be erected by the nurseryman.

The Minister of Agriculture placed the conduct of the whole affair in the hands of myself, and I at once proceeded to make an inspection of all the nurseries for the purpose of instructing the nurserymen how to build their fumigating houses and how to fumigate. The chemicals were sent out from the Ontario Agricultural College in measured quantities suited to the capacity of each house. Very careful instructions were pasted on each parcel so as to reduce the danger from poisoning to a minimum. The substances used were Potassium Cyanide, 98% pure; Sulphuric Acid, sp. gr. 1.84, and water. The quantities used per 100 cubic feet of air space in the house were 25/28 of an ounce of Potassium Cyanide, 1 1/3 fluid ounces of acid, and 2 fluid ounces of water. In this the Johnson formula was followed.

The work of inspecting the nurseries, of preparing the chemicals, and shipping them to the different places required much careful work on the part of the College authorities, for the shipping season of nursery stock was very short this year.

At the opening of the season many of the nurserymen were afraid the work of fumigation would delay the despatch of their orders, but it is believed that all received their chemicals in plenty of time, and that very few suffered from the anticipated delay by fumigating their stock.

From reports received from the nurserymen it must be acknowledged that the initial series of fumigation experiments in Ontario has been a decided success so far as the effects of gas upon the dormant nursery stock are concerned. Very few reported injury to the stock, and these few do not state definitely whether the injury was due to the effects of the gas, or to the effects of the very severe winter upon young trees.

It must be conceded that this successful initiation of gas treatment of nursery stock to prevent the dissemination of the San Jose Scale is another victory for Economic Entomology. The people are gradually being convinced that something can be done to help them in fighting pernicious insect pests.

Inspector Fisher:—I came here at the request of the Minister of Agriculture only to answer any questions as to the condition of the country in regard to the San Jose Scale. It has been pretty generally discussed through the Commission and their report so that *think that* I can add very little to the information you have got from that source.

might say that there are only three points at which the infestation has extended to any great proportions, that of Niagara, St. Catharines and in the southern part of the township of Harwich, in the County of Kent, in the neighborhood of Giles. Outside of these there are a few other points where the infestation has spread to very narrow limits. In addition to this, and what seems to me the most important part of our work was that we were furnished with a list of the nursery stock which was supposed to be infested, in fact some of it had been found to be infested, This nursery stock was followed through every county in the province of Ontario without any exception, and last fall and this summer about one hundred points have been liberated from infestation by the destruction of these trees. We found the Scale in about one hundred places altogether and I was very much struck by a remark which was made by a gentleman living in the County of Elgin with whom a couple of Scale trees were found. He said to the young man who found the Scale and who assisted him in destroying the trees : "Young man every such case of Scale that you find, and destroy the trees, is worth to this country at least, $1,000." Figuring from that standpoint, the value of these trees and the destruction of them is worth to this country at least $100,000. We have not found Scale generally distributed outside the points I have named, and a few others where it is not widely spread.

Professor Lochhead spoke of the Scale as being in the neighborhood of Belleville,—it was found on these young nursery trees down there at Belleville. It withstood 22 degrees below zero quite safely, and at the time, I thought that was miraculous and I reported it to some of our entomologists and also to Dr. Howard of Washington who seemed to think it was extraordinary, but lately I have read a remark in a Bulletin published by Professor Newell, of Iowa, who said the scale would winter at St, Paul, Minn., where several times the mercury was 40 below zero, so that this Belleville matter does not cut any figure, and we may look for Scale in any part of this country. I believe we may look for Scale in any climate wherever trees will grow.

In the Bay of Quinte district in the County of Prince Edward, we have been examining and the examination is not quite completed, but we have not found Scale on anything but these young trees. The Counties of Elgin, Kent and Essex are being examined in the same way; in Elgin no Scale has been found except on these young trees, and in Kent we have found the Scale only in the township of Harwich and on the Town-lines on either side bordering on the township of Harwich. Then there are several points where these young trees were found and it was only at Kingsville where we found the Scale at all. I have noticed this summer that where the trees were allowed to stand and the Scale to accumulate the destruction was far-reaching and rapid. I have been astonished at the distance the Scale will go. It spreads most rapidly in the direction of the prevailing wind, and we can congratulate ourselves that in the district where it is most extensive the prevailing winds will carry them out into the lake. I think that insects carry the Scale a good deal. We have noticed in Niagara lately that owing to the exceedingly dry weather that has prevailed there, the grass seems to have lost its nourishment and the grasshoppers have taken to the trees for food. You can stand and watch them. Sometimes their flight is only for a short distance from one tree to another, at other times they will go away across the orchard. Frequently they fly for a considerable distance. Of course the Scale goes with them wherever they go. I have an idea of my own and I would like very much if some of these learned people would help me to work it out. I have been trying my best to solve the matter for myself, and I find if we put a mature male under the microscope and a little louse beside him the male is about six times as large as the louse, and I have an idea that the male Scale is responsible for distribution. They have broad strong wings and when they fly they go off with a bound, it is no feeble flight. They can go right up in the air like a lark, and I think them quite capable of carrying one or more of these mites with them ; however, I have never caught them in the act, although I have spent a great deal of time trying to do so. I had a splendid specimen the other day. It is difficult to get these males where you can watch them, I found a splendid sample of Scale and I put it on a slide on the stove just a little warm and the warmth of the fire started him out and I watched the male Scale slide about on that piece of wood, and the way he figured on the stick was very instructive to me. He moves about with a business air, he seems to think the whole responsibility of continuing the race rests upon him and he has no time to lose, and I have stirred them up with the point of my knife and watched them as they would fly as far as I could see them, and I have been surprised at the rapidity with which they can fly.

I think they will travel very much further than a few inches, I have watched them very often when they walked more than an inch in a minute. I have watched them at it many a time, and last October, about a year ago now, I was in the Wigle orchard and I found a pear tree there of which nearly the whole of the bottom had been cut away because of blight, and as a natural result of this the growth was strong. There were suckers there about that stump that reached up about six feet, and on the bottom of that young wood there was Scale. It may have been carried there by something else, but in my opinion it would be a very easy matter for them to get there from the stump of the tree, and if you reduce it to figures a little over an inch in a minute would simply mean an hour's walk to get up that stick.

I do not know how we are going to cover the ground by spraying. The past summer there is no doubt the Scale extended beyond the proportion it held at the beginning of the season. We have to spray the peach trees within how many days before blossom?

Professor Webster: That would depend upon the season, sometimes it would be a very few days.

Mr. Fisher: A good many instances have come to my knowledge where last year there was no Scale and now the trees are covered with scales.

Mr. C. C. James, Deputy Minister of Agriculture: I come, as your President stated, to take the place of the Minister who regrets exceedingly his inability to be here. I have come not to talk but to listen. As you of course are aware this subject has presented itself in very large proportions to the Department. As we went on with the work it opened out more and more, and unless you have had special opportunity of following the development, I am quite sure you have no idea of the enormous amount of work that has been done in connection with it.

The work done last year was quite extensive, and this year at least twenty-five thousand dollars will be expended in following up this microscopic insect. I do not know what we would have done if we had not had Mr. Fisher. He is one man in a thousand. We have given him the task and he has gone ahead with it, faithfully and energetically. I know that he and his assistants have been working, not simply in the day, but night and day, and the fruit-growers have been well served by him. (Applause.)

This question presents itself to the Department from various standpoints. As Professor Lochhead said, the Government cannot do everything; we can only direct matters and we hope to have the co-operation of the many persons who are interested. It seems to me that if, during the past years, we had had some instruction in our public schools as to the simple first principles of Entomology, we might have been wonderfully helped in this work. If the public school teachers had known a little more about insects, and had given the children of farmers and fruit-growers some instruction in the subject, we might have made a census of this Scale from one end of the Province to the other, and have started out on our work with more knowledge. Perhaps we would have been warned much earlier. We need more nature study in our schools.

A Member: Mr. Dearness advocates that.

Mr. Dearness is one man in a thousand along that line. There are very few school inspectors who take the interest in the matter that he does. What the Minister desires at the present time is to get some idea as how to carry on this work. Professor Webster says this treatment must not be left to the individuals. Must we send out a corps of men to look after this work? How are we going to introduce this work and carry it out successfully? If it is done it must be done thoroughly. We must employ for it only men who are competent. We feel that this is a question of tremendous importance, that the fruit-growing interests have much at stake in the matter. The further we have investigated it the more we have been convinced of the enormous risks we have been running. The Scale was here at least six years before we really found it out. That shows you how easily it can avoid the observation of the fruit-grower. If it can so readily avoid observation you can see at once that it presents a very serious problem. You have been told of only one of many things we have done. Let me add another fact. We went to the nurserymen who had unintentionally introduced infested American stock, we obtained lists of the men to whom the stock had been sold, and then we endeavored to trace every one of these sales. In some cases the stock had gone through the hands of two or three persons. All these trees were gradually traced and examined at their final location in the orchard. Take the case at Belleville The stock had been auctioned off on the market-square and nobody knew where it had gone. That stock had to be found and most of it has been examined.

If you have any suggestions as to how this work is to be carried out, we would like to get them. Our interests and the fruit-growers' interests are the same. Some people thought we were moving too cautiously and considering personal prejudices too much; others said we were pushing on too vigorously and are asking us not to move so rapidly, to take out only those trees that are badly infested and to allow them to treat the rest. Professor Webster says that if we allow the owners to treat, nothing much will result, and that the Government must come in and do the treating if it is to be done thoroughly. What is your opinion as to what should be done? Any suggestions that will help us will be exceedingly acceptable.

DOCTOR FLETCHER: We have had this afternoon a discussion on one of the most difficult and important subjects which entomologists and fruit-growers have ever had to deal with. It is wise, I think, that we should look at the matter squarely and find exactly where we are. We have had our society here for a great many years under the patronage of the Ontario Government, striving hard and doing good work for the country. We have done much excellent work this afternoon in this discussion. The Government has shown a manifest desire to get at the real facts with regard to the San Jose Scale, so that the wisest legislation may be enacted. To-day we have here the Minister represented and the Provincial entomologist and the Provincial Inspector of San Jose Scale, and we as a Society should recognize this compliment. These men have come here to assist in the discussion and give us the benefit of their experience in working out this problem that we have still to solve. I suppose like every other man I change my views very often. I hope so, when new evidence warrants it; but with regard to the treatment of the San Jose Scale, I have not changed much yet. If I am asked what my views are I can only refer you back to my annual reports for the last three years; every year the same thing. There is no doubt in my mind, or in the mind of any one else that understands these insects, that this scale is to-day, what Prof. Comstock said many years ago, the most pernicious insect we have ever had to deal with. As to how long the insect has been in Canada, notwithstanding all that has been said, we all know well that it was only discovered in Ontario in Mr. Vanhorne's orchard in the spring of 1897, (See Cent. Exper. Farm Rep. 1897, p. 213) and we also all know how quickly it has spread.

Now can it be treated? I acknowledge that it can be treated if—and there comes the rub—if you can get specialists to undertake the work and if you can teach the whole of the fruit-growers in this country that *they are* concerned, that the whole welfare of the country is concerned and that it is their duty to do what will give them some little trouble and expense, but will save the whole province from an enormous loss, I say you cannot do it and you will not do it yet, and I maintain that the time has not yet come when the prosperity of the whole Province should be put at the mercy of men that we know beforehand are not going to do their duty because they have not yet learned that it is necessary. This is not a time for dilly-dallying, and it would appear as if there is little choice for the Government as to their future actions. However, I consider the matter is such an important one that I shall do my utmost to show the danger which I believe exists. Is Ontario going to act in haste and allow a thing to be done that everybody should know is very dangerous, namely, the suspending of the San Jose Scale Act, because a few people who lose a few dollars are making trouble about it? All I can say is that they will repent at their leisure. On page five of my evidence before the last Agricultural Committee at Ottawa, last spring, I spoke rather fully of this matter and I shall be glad to send a copy to anyone who wishes for one. I believe the time has not yet come when we can trust the fruit-growers to treat their trees with sufficient care for an insect like this and protect Ontario from a very great ill. Now, it is a very great ill. Mr. Fisher who is a most accurate, careful man and the one man in Ontario who has had the best chance to see exactly what the effect of this insect is upon orchards, tells us that since the Government relaxed its efforts the insect has decidedly increased.

Is the insect only to be compared with oyster-shell bark-louse? Numerous writers have written and said that it is and is only an ordinary insect. This I say emphatically is nonsense and dangerous nonesense at that. I should like to see an expression from this Society, as a Society, commending most heartily and thoroughly every step that Mr. Dryden has taken in this matter of the San Jose Scale. I did not agree with him at first, but looking back over the history of the infestation during the past three seasons and it is only three seasons, I say I do back up, most strongly and thoroughly, every step he has taken. He has been wise from the beginning, and I say this with all the light of the experience I have had, which is a great deal. I think the operations of his department are to be commended at every step, and to-day I hope that public opinion will back him up and that instead of relaxing the efforts of the department that he will continue to do good for the country as he has in the past.

Mr. Dryden would have been here to day if possible. He has sent us assurances that he could not come here on account of important business. I know personally that he had intended to be here. He has been worried and had great anxiety over this matter because he wants to do what is wise for the country and that is the only thing that has guided him in carrying out measures to protect Ontario fruit-growers, who as a whole have misunderstood him. He has taken steps to destroy all infested trees. He has appointed efficient inspectors, and I lay great stress on that title of efficient inspectors, for I believe they are efficient. I have been in consultation with them through the whole of the work and I do not remember a single serious mistake that has been made by them. Prof. Lochhead is in the same position. Prof. Webster has been consulted and I say that the work has been most remarkably accurate for it was a work of very great difficulty and I maintain that the title of efficient inspectors should be applied to our inspectors. Notwithstanding what was said by some before the commission, the work has been good and of enormous importance to this country; I say it is of enormous importance because directly the efforts to control it stopped the enemy has increased and it is now much more difficult to overtake it; however, I believe it is not impossible to eradicate it even now. I cannot see that it is impossible to eradicate an insect that is once placed under control. When you have got a thing under control it means that you can do what you like with it. When we know that the insect is practically restricted to three small areas in Ontario, I say it would be a thousand pities if the country does not back up the Minister in wiping it out altogether. Some of the owners of infested trees who hid that fact and are now complaining that the compensation is not enough, are themselves responsible for the failure to eradicate the scale. Some of the destroyed trees have been paid for to the extent of one quarter of their value. Let them congratulate themselves on having received any compensation from the Government. What takes place when we are visited by an epidemic disease? Does the Government come forward and say: You have lost three children we will therefore give you three hundred dollars? Not a bit of it. I say the fruit growers have largely themselves to thank for the danger they are in, they have bought from infested districts after they have known well that there was great danger.

Before the San Jose Scale was in this country a warning was sent out saying there was an injurious insect that we were liable to suffer from. "Don't get poor stock, or don't get it from infested localities." But when we give an object lesson the fruit-growers won't even take the trouble to walk across the road to see it. As to the treatment being left to the fruit-growers throughout the country, if that is done by the Government it is simply throwing up the sponge, and I believe it means the wiping out of the fruit industry throughout the Niagara Peninsula for a long time, because I maintain that the San Jose Scale is still with all of our latest knowledge one of the worst enemies we have ever had to fight against.

The treatment of it, if persisted in as it must be to succeed, is expensive and more trouble than these people will go to as a class. Let me give you one instance. Every fruit-grower knows that he can save fifty per cent. of his apples by spraying to prevent the codling-moth injury. I ask you, gentlemen, to think among your acquaintances how many *ever* spray. It is true ten years ago there were perhaps not more than one hundred spraying pumps in the country; now there are perhaps a hundred thousand. That means we have some thousands of good business men who want to save their money; but are there not hundreds of thousands who don't do it, and that with a big caterpillar nearly an inch long which they can easily see? That being the case how can we expect that they will do it with an insect you cannot see, except by the use of a microscope, even when the trees are swarming with them?

I agree with Mr. Lochhead in everything he said. The Scale is not quite so destructive in Ontario as in Maryland. I have here a photograph of an orchard of 28,000 trees, absolutely destroyed in three years from the time they were infested. What was the value of these trees? An average of $5.00 apiece at the very lowest estimate. They were wiped out in three years and the whole orchard wiped away. That is what the San Jose Scale can do in the South.

Then we have some accurate statistics telling us about the rate of increase of the Scale. The increase of the Scale in Maryland and the Southern States is 300,000,000 from one in a year; let us reduce that, because we are further to the North, and say it is annually increased half of that number, 150,000,000 from one in Ontario, is that not enough? Is not 150 millions from one insect enough of an increase in a year? Then they say it is not likely to come up here in the North and do harm. The plague of London is the same black plague of Asia, but it spread up into England and in 1665 wiped out the greater part of the population of London. We know the San Jose Scale is a bad enemy and we do not want to play with it.

We have got it now measureably under control and we should let the Ontario Government go on doing what they have done, and as I say, every member of this Society ought to back them up in doing it. The Ontario Government has certainly been a benefit to the whole country in this matter, not only to Ontario but the whole country, and I say we should back them up and say that we appreciate the great efforts they have made and I do hope Mr. Dryden may long be the Minister of Agriculture to carry on the administration of the department. I am not a politician. I am a Government servant. I never cast a vote and as long as that is the case never mean to. I do not care whether a man is a Liberal or a Conservative. It is nothing to me; but I say here is a man who is a good servant doing good work for the country and work that has been done in the best way, and to stop or hesitate now is bad for the country. What are we going to do in the future? I say let us help him. We have with us to-day Professor Webster: we have known him for a great many years; one of the first economic entomologists in the world; one of the first in America and that means the world, because with the exception of Miss Ormerod they hardly know what economic entomology is on the other side of the water. Mr. Webster is a man that would tell the President of the United States:—"You are wrong," just the same as he would me or any other insignificant person, if he thought so. We have him here and if he advises us as to the best treatment, let us listen to him. Experience has taught us, there are two good things—treatment with hydrocyanic acid gas and spraying with kerosene. These are so difficult to use safely that people won't, I feel sure, take the necessary trouble. In the whale oil soap we have a remedy easy to use, not very expensive, but a little more expense than our fruit growers will go to after the first year. They are not going to pay the price of even three cents a pound for the amount which will be necessary to control the pest after the first year.

MR. DEARNESS:—You can get it for two cents a pound now.

DR. FLETCHER:—They won't go to the expense of two cents a pound for it. It takes a good many pounds to go over an orchard and after the first year I don't think we can trust our fruit-growers to do that work. This is no experiment. Many things can be done that are not, if they cost money and trouble, it is the same with the hydrocyanic acid gas. If Prof. Webster was going to fumigate trees, I would say he can kill every Scale, but an ordinary man will not do it. We have to deal with the actual defects which commonly occur in mankind. The thing is practicable if carried out properly and the man who makes the statement that it cannot be carried out is not a practical adviser. If we can teach the fruit-growers of this country that it does pay them and can persuade them, well and good, but I doubt it. For ten years I have been working on this kind of work and I know only too well there is a great deal of difficulty in persuading people to do even what will save them money, when you go to the orchards and houses of fruit-growers and see the way they do this work of fighting insects. I was in the fruit house of a fruit-grower whom I persuaded to buy a pump, and I said "Where is your pump, why don't you use it?" He said, "We did not use it this year, there is no crop." Another man wrote to me from British Columbia showing great interest in spraying. "What is the best kind of pump? I want to get nothing but the best," etc., etc. I was in his orchard this summer and asked him about the pump. He said, "I have not unpacked it, I have been too busy." He imported it from here, got it out there and then had not time even to cut the string that tied the handle on to the pump!

I approve most heartily of the measures adopted to wipe out the San Jose Scale by the Provincial Government and I shall help them in any way in my power. Of course, politics are a very different thing from entomology. As an entomologist I say the work was well done. I do wish to express my appreciation of the work that has been done by the Government, of Professor James for his activity in the department, and Mr. Fisher in his honest and straight-forward dealing with this question. I said to Mr. Dryden last year, "If Fisher has got to go into an orchard and find the San Jose Scale he will treat his own brother or himself as he would anybody else and will destroy everyone of his own trees if he finds them infested." At first Mr. Fisher was a specialist, now he is an expert both as an entomologist and as an enthusiastic man, and I say to-day is the time for people to acknowledge it for the country should know it. We must recognize this question as one to be fought out It is a serious matter and we have not got to the bottom of it yet. Let us have every suggestion that will help us.

THE CHAIRMAN:—I think we should not undervalue the force of example. There is a place called Abbotsford in the Province of Quebec, one of the few places where apples are grown to perfection. There was an intelligent fruit-grower there, Mr. Charles Gibb, who took to spraying his trees, and I know that a few years afterwards there was not a man in that neighborhood who did not spray his trees. Whether they continued to do so I do not know; the example was catching. Would it not be possible for the Government to induce some good man in one district that has been referred to, to spray his trees and to watch the result and see whether his neighbors would not catch the idea from him and follow up his method? Whatever other plan may be taken by the Government it seems to me that the power of example should not be overlooked. We have had a very valuable amount of instruction to-day, and if there is any one else who would like to make any remarks we would be pleased to hear him.

Mr. W. E. Saunders then moved, seconded by Mr. J. Law, that a committee be appointed to draft the resolution asked for by Dr. Fletcher, to consist of Mr. Lyman, Dr. Bethune, Dr. Fletcher, Mr. Balkwill, Mr. Dearness and Mr. W. E. Saunders, and to report at a later session of the meeting.—Carried. The meeting then adjourned.

EVENING MEETING.

A public meeting was held in the hall of the Y. M. C. A. building at 8 o'clock. There were about seventy-five persons present, including the Right Rev. Dr. Baldwin, Bishop of Huron, and many ladies. The proceedings were opened by the Rev. Dr. Bethune, who cordially welcomed those present, and introduced the President, Mr. Henry H. Lyman, of Montreal, who delivered his annual address as follows:

THE PRESIDENT'S ANNUAL ADDRESS.

BY HENRY H. LYMAN, M.A., MONTREAL.

LADIES AND GENTLEMEN:—It is again my duty as well as privilege to address you at this the thirty-sixth annual meeting of our Society, and to congratulate you upon the continued success of its work and the high standing maintained by its monthly journal. At our last annual meeting it was a matter of regret that so few members from headquarters were able to attend, but it was a great treat to the members of our Montreal Branch to have the meeting held in that city, in connection with the celebration of the twenty-fith anniversary of the formation of the branch, as it was the first opportunity that our members had had of attending an annual meeting of the parent society since 1882, the only other occasion when the annual meeting was held in Montreal.

In beginning my address last year I dwelt upon the difficulty experienced by an amateur entomologist in composing an annual address, but if I was in difficulties last year, I am in much greater straits now, as not thinking of a second term in the presidential chair, and following the scriptural injunction to "let the morrow take thought for the things of itself," I not only put into that address almost everything I could at the time think of, but also all the items of interest that I could beg or borrow of my friends, and now find myself somewhat in the position of a clock which having struck twelve has to come down to striking one.

Last year I had, shall I say, the temerity to lay before the meeting a great many suggestions, the adoption of which would, I ventured to think, be of material benefit to those engaged in the prosecution of studies in this science, but I am not aware that the slightest movement has been made towards the adoption of any one of them.

I hope that it was not a case of a fool rushing in where angels, if there are any entomological angels, fear to tread, and shall, in order to save my amour propre, at least try to believe that it is only another instance, of which there have been so many in the history of the world, of a reformer being in advance of his time. But while the non-success of my suggestions last year should, perhaps, be a warning to me to leave the making of suggestions to more influential persons, I cannot refrain from re-iterating the opinion that a well-organized Entomologists' Union, on similar lines to those on which the Ornithologists' Union is carried on, could be made of very great benefit to the science of entomology.

Last year I ventured to point out a number of matters which such a union could deal with to advantage but many more could easily be suggested. I recently had an example of the necessity for such an organization for the settlement of matters of nomenclature. A gentleman friend, not a naturalist, but only one who takes a sympathetic interest in such studies, invited me into his office and proceeded to describe enthusiastically the beautiful chrysalis of our milkweed butterfly which he had been shown by a gardener who had found it, and when I said I knew it well, he rashly asked me its name. Immediately I was in a quandary, should I give him only one name, choosing maybe that which I might myself prefer, or should I risk his mental equipoise by plunging him without preliminary training into the vortex of the battle of the synonyms? After a moment's hesitation I decided upon a compromise giving him his choice of three names, writing down, lest even these should be too great a strain upon his memory, that it used to be called Danais Archippus, but that many authorities now hold that it should be called Danais Plexippus, while Dr. Scudder calls it Anosia Plexippus, and as they say, I let it go at that.

Last year I suggested, as one of the things which such a union could deal with, the question of a uniform standard method of pinning and spreading specimens, but there is another point in this connection upon which a recommendation might be of some service, and that is in regard to setting a fair number of specimens to show the under side. Nothing has caused me greater surprise than finding large and important collections of butterflies without a single underside showing. I defy anyone to separate the North American species of Argynnis, Colias, Grapta, and a number of other genera from a study of the upper sides only, and when I am shown ten or a dozen cabinet drawers filled with specimens of Argynnis with not an underside among them, the effect is simply maddening, and I am sure that an attempt to study this group under such circumstances would speedily reduce me to a state of utter imbecility. In the magnificent work of Mr. Wm. H. Edwards the undersides of the species treated of are invariably shown, and why they should be excluded from the cabinet I cannot conceive. The failure to show the undersides of the species not only renders the study of types much more difficult but also greatly endangers the types as it becomes necessary to remove the glass covers of the drawers and handle the specimens in order to see the undersides.

Another point which could with great advantage be decided by such an authority is the nomenclature of the larval rings. Considerable diversity has existed upon this subject, some authors counting only twelve segments, excluding the head, while others, and doubtless the majority of recent years, have, possibly to show their superiority to antiquated superstition, made the number thirteen by counting the head as number one. But one is still frequently in doubt as to which method an author follows until one has made a careful study of the description. Would it not be better to discard both these systems and follow that adopted by Dr. Scudder, and divide the larva into head, 1st, 2nd and 3rd thoracic, and nine abdominal segments? Under such a system there could be no possibility of any misunderstanding.

Last year I ventured to assert that we should never have a natural and therefore scientific and satisfactory classification of the Lepidoptera until we know them in all their stages, and if this is admitted, the importance of working out the life histories becomes immediately apparent. An encouraging amount of this work is now being carried on though very much less than might and should be done. The reasons for the paucity of this work are not very far to seek. In the first place there are not half enough entomologists, and those that we have are generally overworked. The amateurs, like myself, are generally only able to snatch a half hour or so at a time from their regular occupations to do such work as describing preparatory stages, which can only be done satisfactorily by daylight, while many who are much less favourably situated cannot even do that. Many, unfortunately, care only for accumulating a collection of imagos, and in the case of these we can only hope that they will grow from mere collectors into true entomologists, but probably the chief reason why more do not take up this interesting and important work is its inherent difficulty. With many species it is easy enough to secure eggs and to rear the species through all their stages, but to make descriptions of those stages which shall be of any use to a specialist is generally speaking a very difficult matter unless one has had very special training. This is, of course, largely due to the great advance of our knowledge, the requirements of which have become continually more exacting. The older authors, those who have been called the fathers of entomology, were certainly more comfortably off in this respect, as it seems to have been considered sufficient to give such descriptions as the following: "Senta Ulvæ; Larva, yellowish ochreous, with several fine lines. In reed (Arundo Phragmites) September, March, April," or "Xanthia Aurago; larva grey, with oblique darker streaks, on beech in May."

Nowadays such descriptions would not do as we are expected to note and describe everything, down to the minutest detail. We must begin with the egg-laying by the parent and go through all the stages to the imago.

Many hints and directions for the uniform description of larvæ have been published from time to time. Such a paper from the pen of Dr. William Saunders appeared in the second volume of the "Canadian Entomologist," and our society published forms for this purpose, but for some reason, possibly from their not being listed with the other entomological supplies, they were not much used. But these hints and directions, though excellent, are hardly up to present requirements.

The following are the directions of Dr. H. Guard Knaggs in his Lepidopterist's Guide for the young, not the veteran, collector.

"In carrying out observations upon the egg state, the student should note :—

How the egg is laid : Whether unattached or attached ; or if so, by what means, and also by what part of its surface ; the position of the female (and of her abdomen) at the time of laying—whether hovering, at rest, or in what other act ; whether the eggs are laid singly or in batches, and, if so, in what number, and whether unarranged or how arranged ; also the total number deposited and whether nude or covered, and, in the latter case, how covered or protected, together with any exceptions, individual, special, natural or abnormal.

When laid : At what date or dates, at what time or times of day or night ; at what intervals, how long after copulation and how long after emergence of the female.

Where laid : If not on the food plant, where ; if on the food, the exact position.

The duration of the egg state, in species and in individual cases ; influences of temperature, soil, locality, altitude, time of year, etc., which promote, retard or modify the natural changes.

The appearance of the egg itself, as to form, colour, or colours, markings, elevations, depressions, and sculpture on the surface ; together with changes, normal as well as irregular, from the time of exclusion to that of hatching.

The mode of exit of the larva should be exactly observed and any other remarks or experiments which may present themselves to the student, should if possible, be followed up ; such as, for instance, those of proving how long the egg state may continue (i.e., the ovum retain its vitality) with a view to throwing light upon the, at present, hidden causes of the disappearance and periodical re-appearance of certain species ; and of discovering if there be any sexual arrangement of the eggs, as laid, to account for the emergence of a preponderance of one sex of the future moth at one time, of the other at another, from the same batch of eggs.

In describing, the best order will be to give the names of the parent species, and then, by the assistance of microscopical examination, in their order, the measurement, form, sculpture, colour, markings and changes ; the arrangement of the eggs, time, situation, etc., after which a diagnosis from the allied species may be added, as well as any further remarks which may suggest themselves."

So far Dr. Knaggs, and when we have got that far, mind you, we have only got these little creatures out of their eggs, and I might go on at great length giving the directions for observing and describing the caterpillars, but I spare you. Let it suffice to say that we are urged to carry out the observation and description of all the succeeding stages, with the same care and attention to all the possible and impossible minutiæ ; but surely this is a "counsel of perfection" unattainable by ordinary mortals, and especially by busy men.

But even taking a much lower view, the standard expected is still high. We have before us a little creature, perhaps barely a tenth of an inch long, divided into a head and twelve other segments, upon each of which there are various appendages, and we are expected to describe all these things correctly in spite of the fact that the owner of the appendages is constantly crawling out of focus, and perhaps after all our trouble, when we think that we have drawn up a fairly correct description and venture to publish it, some subsequent observer, in a "criticism of previous descriptions," perchance accuses us of having put some appendage upon the wrong segment. Of course, when we have abundant material we can kill a specimen or two occasionally in the cyanide jar and then describe them at our leisure, but often we cannot spare any for this purpose, especially in the case of species which are difficult to rear.

Occasionally we come across a species, the larva of which is easy to describe, but as a rule it is very difficult to make a satisfactory description. The markings are often puzzling and the colours are frequently indescribable, it being almost impossible to give them names. This chiefly arises from the more or less translucent nature of their bodies and from the way one shade melts, as it were, into another. In many cases in which there is not much change after the first moult, we still notice, as the larva grows, certain things which we had not noticed in the earlier stages, and then we are haunted by a horrible uncertainty as to whether these points have really developed in the later stages, or were only overlooked when the creature was much smaller.

But, doubtless, the chief difficulty in the way of the general preparation of useful descriptions of preparatory stages is that probably at least nineteen men out of twenty do not know what are the chief points to be observed and described, and hence we find some men describing, with conscientious and laborious exactness, organs or appendages which are common to at least all the larvæ of the particular group to which the subject of their observations belong, or on the other hand, contenting themselves with making the slightly vague statement that there are "a number of warts with radiating bristles on each segment."

To overcome these difficulties and to bring the work of as many observers as possible into harmony, it seems to me that we require a simple but comprehensive "Manual" for the study of preparatory stages which, while avoiding diffuseness and unnecessary technicalities, should still be precise and explicit, taking only the most elementary knowledge for granted, and as fully illustrated as possible; not only showing a figure of a typical caterpillar, but having outline figures of all types of larvæ, showing how organs and appendages are modified and how they can be homologized, and with the fullest particulars of the important points to be observed in each type of larva, and with typical descriptions drawn up from common and well-known larvæ as models.

After a careful study of such a work with as many specimens as we could conveniently lay our hands on, we would be in a position to make thoroughly useful descriptions because knowing what we should look for, we would not overlook important points, but would find them, if present. But I shall probably be asked who is the man for this task, and in reply would say that, in my humble opinion, Dr. Harrison G. Dyar, who has made such extensive studies upon many different groups of larvæ, is well qualified to undertake it, and it could probably be issued as an official bulletin by the Department of Agriculture at Washington.

Another work which is also much needed is a supplement to the "Bibliographical Catalogue of the Described Transformations of North American Lepidoptera," prepared by the late Henry Edwards, and issued as Bulletin No. 35 of the United States National Museum in 1889; or what would be still better, a revised edition brought up to date of the same work. Such a work is most important in order that people may be informed as to what work has already been done, and what is lacking to fill up gaps.

I have said that a knowledge of the preparatory stages is necessary for a satisfactory classification of species, but I believe it to be also necessary in some cases even for the discrimination of species. An extremely interesting case of this kind is that of the two forms, or as I believe them to be, the two species of Halisidota, viz. Tessellata, A and S., and Harrisii, Walsh. You are doubtless aware that as long ago as 1864 the late Benjamin D. Walsh called attention to the fact that there were two kinds of larvæ of Halisidota producing imagos which were indistinguishable, one being the species named Phalæna Tessellaris, by Abbott & Smith, but now known as Halisidota Tessellata; and the other an undescribed form or species which he named Halisidota Harrisii. These two forms of larvæ differ remarkably, and would never be taken for anything but species of the same genus. The larva of Tessellata, as you know, varies remarkably, but only within well-known limits. The body is usually black or blackish; the head generally black, but occasionally tinged with reddish brown, the feet black, the prolegs blackish, the hairs cinereous, blackish on the dorsal ridge, or a yellowish-brown with darker ridge. Occasionally one is found when about half grown of a gamboge yellow, with a tinge of pink in it, but these change before maturity to one of the usual types. The principal appendages are four pencils of black hairs, with white pencils below them on the thoracic segments, two each on the second and third thoracic segments, and two black pencils on the eighth abdominal segment. There is also a lateral white pencil on each side of the second thoracic segment and some long hairs on the ninth abdominal one. In Harrisii, on the contrary, the body and hairs are milk-white up to the last moult, the mature larva being of a rather dingy brownish-yellowish shade, slightly darker on dorsal ridge. The head is yellowish-brown, while the pencils, which are black in Tessellata, are orange in Harrisii, except that there are no orange pencils on the posterior part of the body, but only two whitish ones projecting backwards on the eighth abdominal segment. The feet are yellowish, tipped with reddish-brown, and the claspers whitish. Thirty-five years have now elapsed, and yet the question as to whether these are distinct species or only interesting varieties has not been definitely and satisfactorily settled, a fact by no means creditable to North American lepidopterists.

Some years ago I became interested in this question, and with a view to making experiments imported and set out in our Mount Royal Park in Montreal a plane tree (Platanus Occidentalis). It has now grown to be a fair-sized tree about 25 feet high, and last year I began my experiments by securing the eggs of Tessellata. These in due time hatched and were divided between several glass breeding jars, in one of which I had leaves from my plane tree, and in the others oak, bass and other trees. I had no difficulty except with those on the plane, but they refused to eat. Fearing they would starve immediately I gave them an oak leaf for a start, and after they had had a meal or two took it away and left them only the plane. This hunger forced them to partake of sparingly, but they did not relish it, and the mortality was heavy. A number passed first moult, but I only succeeded in carrying two past the second, after which they died.

This year I appealed to Dr. Dyar to try to get me specimens of H. Harrisii, and he and his assistant very kindly devoted part of a day to looking for them, but they were only successful in finding four. These were sent me, but naturally I was not able to make many experiments, and only found that while they preferred plane they would still eat bass and elm. The larvæ, are however, so very distinct from Tessellata that it seems probable that the species is distinct in spite of the imagos being indistinguishable. I would be inclined to lay down a law that where any two forms are certainly distinguishable in any of their stages, and where the two forms are never found to breed, the one from the other, or to occur in the same brood, they are entitled to rank as distinct species.

The truth in regard to these particular forms ought to be easily investigated in any locality where Harrisii occurs in moderate abundance. All that is necessary is to secure a fair number of larvæ, and when the moths are disclosed from the resulting cocoons to mate them and then secure as many eggs as possible, preserving the parent moths and keeping the batches of eggs separate. If under these circumstances the larvæ were all of the Harrisii type it would be fair to conclude that the form is a good species, though it would be all the better if a further experiment were tried, viz., to see if Tessellata and Harrisii would mate and produce fertile offspring with characteristics of both forms in the preparatory stages.

I have thus attempted to show the importance not only of the study of preparatory stages, but also of experimentation therewith, but there are many other and more practical subjects for study and experimentation than those to which I have alluded, such as the possibility of propagating and disseminating bacterial diseases among caterpillars as a means of checking the ravages of injurious species, and this leads me to direct attention to the utter lack of all provision of facilities for the carrying on of such work at the Central Experimental Farm.

Last year I referred to the excellent work being done by our Dominion Entomologist Dr. Fletcher, but he is greatly handicapped by the lack of almost every requisite for the efficient prosecution of his work. It is true that since our meeting last year he has been given another assistant in the person of Mr. Arthur Gibson, a director of this Society, but much more than this is needed, and the farm should be equipped with an insectary of the most approved design. and also, I would suggest, with a small cold storage chamber for the successful wintering of pupæ and hibernating larvæ, which might be the subjects of experimentation. There are many such insectaries in the United States, and it is high time that we had at least one in Canada, especially as no great outlay would be necessary, and I would respectfully represent to "the powers that be" that there is no economy in employing a first-class entomologist and not giving him every facility for doing the very best work of which he is capable.

But I must pass on to other subjects, and would invite your attention to a rapid review of some of the more important work being carried on by leading workers in this branch of science.

In Canada, owing to the opposition to the working of the San José Scale law in Ontario, a commission was appointed to inquire as to the extent of infestation, whether it had spread beyond its former limits, whether the destruction of infested trees would check the further spread of the scale, whether it would be possible to exterminate it, whether there was danger of further infestation from scales being carried across the Niagara River, whether opposition to the act was unanimous, how the work of inspection had been performed, the commissioners being invited to make any suggestions they thought desirable as to changes in the mode of procedure, and as to measures for the complete suppression of the pest. The commissioners appointed were Dr. James Mills, President of the Agricultural College at Guelph, chairman, with Mr. John Dearness, ex-President of this Society, and Mr. W. H. Bunting, of St. Catharines. The inquiry was opened on 20th June and closed on 14th July, the Commissioners visiting the counties of Lincoln, Welland, Wentworth, Elgin, Kent and Essex in Ontario, as well as the New York side of the Niagara River and Catawba Island in Ohio, and examining one hundred and sixty-eight witnesses. In regard to the amount of infestation and the extent to which it had been controlled, it was found that the greatest infestation is in one corner of Niagara Township, near Niagara on-the-Lake, and in the Township of Harwich, Kent County, in the neighborhood of Guild's Post-office. There is a limited infestation at Kingsville, and less important ones at St. Catharines, Winona, Burlington and near Chatham. In ninety-one other cases trees planted within the last two years were found infested. These trees were all destroyed, and this year's inspection failed to discover scale in any but thirteen out of the ninety-one places. The scale was found in five nurseries, but the infested stock was destroyed. While the areas of infestation are not large the inspector estimated that it would be necessary to destroy over 150,000 trees to be reasonably sure of exterminating the scale. The inspector thinks that the scale can be exterminated by the prompt and vigorous enforcement of the Act, but the Commissioners incline to the opposite opinion, and they also believe that the damage which the insect is capable of doing in this latitude has been overestimated. They found that, as was to be expected, the owners of orchards were not unanimous in opposition to the Act, for while those whose orchards are not in immediate danger are overwhelmingly in favor of it, those whose orchards are infested or in immediate danger of becoming so oppose it, largely on account of the inadequate compensation allowed for trees which are destroyed, but also because no effort was made to save valuable trees which were only slightly affected, and because the owners had no voice in the determination of the value of the trees destroyed. The Commissioners, while acknowledging the faithful work of the inspector and his assistants, thought that more consideration might have been shown for the feelings of the owners of infested trees and a less offensive method of marking such trees adopted. They advised a continuance of the inspection on modified lines for some time to come but that valuable trees be treated for the purpose of destroying the scale without cutting them down and that owners of trees not so badly infested be required to treat them by a prescribed method once a week from the time of notice till the 15th

October. They also recommended that the compensation for trees destroyed be increased, the owner being allowed twenty-five per cent. of the value including the crop and that he be represented in some way at the valuation. They also recommended that the utmost care be taken to prevent the spread of the scale and that a circular of instructions be prepared and sent to every orchardist in the infested areas and that every owner of an orchard in the Province be encouraged to make a careful inspection of his orchard next winter to discover whether or not there is any San José Scale in it.

In the United States the work in connection with the San José Scale has been largely carried on by the Agricultural Experiment Stations, but the proposed law governing interstate commerce in nursery stock failed to pass the American Congress. An important series of investigations, however, was carried out last autumn at Washington for the purpose of determining whether it is possible for the scale to remain alive upon any fruit dried by any of the methods in use in the United States. This work was aimed especially at the German regulations prohibiting the introduction of American dried fruit into that country. The results of that work as published in Bulletin No. 18, New Series, were very satisfactory as it was fully established that any one of the commercial drying processes is absolute death to the scale insect.

Mr. Marlatt has undertaken a systematic study of the armoured scales (Diaspinæ) and has cleared up many doubtful points of synonymy, the most interesting point, perhaps, which he has brought out being the occurrence of the European Aspidiotus Ostreæformis in the United States where it has existed unrecognized for several years, although late correspondence shows that it is already distributed from New York to the Mississippi River and even to Idaho.

Dr. Howard has had a careful study of the insects injurious to the forest trees of the extreme north-western states carried on by Dr. A. D. Hopkins who was employed as a temporary field agent for that purpose. He made a careful study of forest conditions in Northern California, Oregon, Washington and Idaho and found very many new Scolytidæ and has been able to make practical suggestions which will be of value to the lumbermen in that region. This work should also be of value to our lumbermen in British Columbia and the information obtained should certainly be made available to them.

Further work on the study of insects liable to be introduced from abroad has been carried on by Dr. Howard and his assistants. One of the latter was sent to Porto Rico in the spring and made large collections of the injurious insects of that island and further observations are being made. Dr. Howard has been accumulating a large collection of injurious insects of first-class importance from different parts of the world, especially Australia, Japan, Mauritius and Reunion, while the collection of European injurious insects has been greatly added to. The importance of this line of work was strikingly illustrated in an instance which occured in the spring of this year, when an insect boring in the stems of orange received in California from Japan was at once recognized by a comparison with the specimen received some time ago from that country, the habits of which had been previously reported upon.

Late advices show that the importation of Novius Cardinalis into Portugal, which were sent by the Washington office through the courtesy of the State Board of Horticulture of California, was fully as successful as anticipated and all danger from Icerya in the extensive orange groves along the River Tagus is now considered a thing of the past.

Mr. Chittenden has been working mainly on garden and orchard insects and has published his results in Bulletin No 19, New Series, a pamphlet of 99 pages replete with most interesting information.

The usual Western field work on injurious grasshoppers has been carried on and it is claimed that Mr. Hunter, the temporary field agent, has set at rest all rumors in regard to the Turtle Mountains region in North Dakota and Manitoba as a possible permanent breeding ground of Melanoplus Spretus, and it is charged that the occasional swarms which have settled in Dakota and Minnesota have come from the region of the Assiniboine River.

Dr. Howard has published in the year book of the U.S. Department of Agriculture for the year 1898 an important paper on the insects affecting the tobacco plant, which is admirably illustrated by a new series of cuts, and three new pests are treated of But by far the most interesting and important work which has been recently accomplished by Dr. Howard and his assistants is the successful introduction into California of the insect named Blastophaga Grossorum.

Hitherto it has been found impossible to grow in that state any figs which would compare with the Smyrna fig of commerce, which is grown about the eastern end of the Mediterranean Sea. The Smyrna fig tree had been started in California but the flowers were sterile and the figs invariably dropped to the ground before attaining the size of much more than three-quarters of an inch in diameter, but in its native home the flowers are fertilized by this minute insect know as Blastophaga Grossorum, which normally inhabits the flowers of the wild fig commonly known as the caprifig. These figs growing on the mountain side are broken off by the inhabitants and are tied to the branches of the Smyrna figs at the proper season of the year. The insects issuing from the caprifigs and covered with pollen crawl into the Smyrna figs, pollenizing the flowers and bringing about the ripening of the fruit and the production of the seeds upon which the flavour of the Smyrna fig largely depends, and it was decided that the only way in which a fig equal in quality to the Smyrna fig could be grown in California was to introduce the Blastophaga into that state. Private attempts to do this failed and the government was appealed to for aid, and Dr. Howard, after laying the matter before the Secretary of Agriculture, was authorized to make the attempt and succeeding in introducing living specimens of these useful little insects among the Smyrna figs and caprifigs of Fresno, California. The introduction in 1898 was unsuccessful, but this year success crowned the efforts and not only have two generations of the insects developed but many Smyrna figs have been successfully fertilized.

Work is being continued by the Washington Staff on the study on the geographical distribution of injurious insects ; the bibliographical work also continues and it is intended to publish another supplement to the Bibliography of Economic Entomology bringing the list down to January 1900.

That the importance of entomology continues to attract increased attention is shown by the appointment of a state entomologist for Texas. The lamented death of Mr. H. G. Hubbard early in the year interrupted the completion of his elaborate work on insects affecting the citrus trees, and caused a great loss to American entomology. He was an able entomologist, a wonderfully good collector and a truly lovable man.

Last year I had the pleasure of announcing the approaching publication of Dr. W. J. Holland's Butterfly Book. Shortly after our meeting this work was issued and received a hearty welcome from the entomological world, and up to 1st of July last upwards of 3500 copies had been sold, which is certainly remarkably encouraging. Among other important works which have appeared during the year may be mentioned the Monograph of the Species of Acronycta and certain allied general with nine plates of moths, four plates of larvæ and nine plates of structural details, by Drs. John B. Smith and Harrison G. Dyar issued in the proceedings of the United States National Museum, and which is a very important and useful work. About the same time in December last appeared Dr. Henry Skinner's Synonymic Catalogue of the North American Rhopalocera replacing Mr. W. H. Edwards's catalogue of 1884 which had been out of print for some time. This work was much needed and will be of great assistance to lepidopterists. Dr. Dyar's proposed check list to which I referred last year has not yet appeared as the author informs me that he is waiting for Prof. Fernald to complete his revision of the Tortricidæ. Dr. Ottolengui has not yet completed his monograph of the Plusias but expects to issue it during the coming year.

I am glad to say that we are likely soon to have a monograph of the Sesiidæ. The late Henry Edwards who had done much work in this group and had described a very large proportion of the known species contemplated the publication of such a monograph but was not able to do so, but after his lamented death his mantle fell upon Mr. Beutenmuller who had special facilities for the work in having all Mr. Edwards's types under his care in the American Museum of Natural History, and who has been working upon the group for some years. He has now secured the consent of the Directors of the Museum to the issue of the monograph and it is expected to appear next year. Dr. Packard has been delayed in regard to the publication of the second volume of his monograph of the Bombycine Moths and it will not appear during the coming year. He is waiting to fill up some gaps in the life histories and to obtain good coloured drawings of the larvæ of Platysamia Gloveri, P. Columbia and other forms. The part will include the Ceratocampidæ and Saturniidæ, and any collector who can obtain the eggs or larvæ of P. Columbia would be rendering a service to science by contributing them to aid in the completion of this work. Though not published during the present year attention should be directed to Dr. Packard's Text Book of Entomology, a most important treatise on the anatomy, physiology, embryology, and metamorphoses of insects which has been accorded a very flattering reception not only by the leading entomologists of this continent but also by those of the old world.

Among other publications may be mentioned the pamphlet on the Hessian Fly in the United States prepared by Herbert Osborn and issued as Bulletin No. 16. New Series, of the Division of Entomology at Washington.

Mr. Wm. H. Edwards although retired from active entomological work has not wholly given up his interest in this subject. and recently wrote me that he had urged Mrs. Peart to fill up some of the gaps in his album of drawings of preparatory stages of the butterflies, and said that he wanted to see these drawings deposited in some public institution where they would be available for reference, and it is much to be hoped that this disposition of them will be made. The formation of an Entomological Society in the Canadian North-West Territories is an event of which we should all be glad. It is much to be hoped that the interest which the energetic President has awakened will continue and increase and bear good fruit, and that the Society may become affiliated with us as a branch, and this leads me to the suggestion that it would be an excellent thing if there were more co-operation among the branches of the Society. The Montreal Branch suggested that an interchange of all the more important papers read before the various branches would enable all the members to have the benefit. This suggestion was warmly received by the Toronto Branch, and a few papers were sent up from Montreal, and although the idea has not proved as fruitful as we hoped it would, better results may be, and I trust will be, achieved in the future.

One other event of the past season to which I should refer, was the advent through the medium of the daily press, of a terrible bogey in the form of a bloodthirsty insect which was "written up" by the knights of the quill under the name of the Kissing Bug. It was said that its scientific name was Melanolestes Picipes, and the wildest stories were told of its deadly ravages. Illustrations of it were published, and various kinds of insects of different orders were exhibited in newspapers' windows as genuine specimens of the bug. Quite a number of deaths were attributed to it, and many timid people, especially women, were seriously alarmed. It started from Washington (there is something very suspicious about this, but perhaps our friends of the Division of Entomology can establish an alibi) and spread all over the continent, creating devastation everywhere with the exception, it is said, of Baltimore, whose newspaper men are reported to have been too conscientious to write it up, though the latter statement seems almost more incredible than the stories told of the bug. At last the secret was given away and the kissing bug pronounced a myth, the story having been started as a hot weather silly season hoax.

I have again to acknowledge my indebtedness to Dr. Howard for his kindness in favoring me with much interesting information and valuable suggestions which have been of much service to me in the preparations of this address. And now in laying down the office with which you have honored me, and retiring to the comfortable dignity of a Past President, I desire to thank you most heartily for the honor you have done me in electing me to the highest office in your gift, and especially are my thanks due

to the other officers of the Society for their unfailing courtesy and their readiness to afford me every assistance in their power, and to you, ladies and gentlemen, who are not entomologists, I would say that if you have been dreadfully bored by my address you must pour out the vials of your wrath upon the heads of the Council who arranged that it should be delivered at this meeting instead of being read in the sanctity of the Society's own room.

The Rev. Dr. Fyles expressed the thanks of the meeting to the President for his interesting and valuable address. In the course of a humorous speech, which was much enjoyed by the audience, he stated that when it is borne in mind that at least one-tenth of the vegetable products of the country are annually destroyed by insects, the study of their habits and of the best means of dealing with them is of manifest importance.

Dr. Fletcher gave an address illustrated with lantern pictures, on "Some Interesting Insects." He prefaced his remarks by referring to the statement of the previous speaker regarding the loss caused by insects and said that if there was even a chance of saving some of this ten per cent. loss the study of entomology must be of great economic importance. He considered that a great deal of the destruction of food products by insects is preventable and that entomologists were doing a most valuable work in instructing the community as to what measures were the best to be taken for the purpose. He spoke also of the many points in the life-histories of common insects that still require to be investigated, and of our want of knowledge of the manner in which they lived through the winter. Here was a field that would afford ample employment to every entomologist. Beautiful illustrations of the following and several other insects were thrown upon the screen and their peculiarities or points of interest described by the speaker: The Gipsy Moth (*Ocneria dispar*) which derives its specific name "Dispar" from the great disparity in the sizes of the male and female moth, the latter being nearly double the size of her mate. The state of Massachusetts has been engaged for the last nine years in trying to exterminate this insect and has spent close upon a million dollars in the effort. While the object in view has not been completely accomplished, the insect has been prevented from spreading over the surrounding country and is confined to an area that is gradually becoming more restricted.

The Brown-tail Moth (*Euproctis chrysorrhea*, Linn.) is another importation from Europe in the state of Massachusetts which is proving very destructive. Active measures however are being employed for its extermination in a similar manner to the preceding species.

The Mediterranean Flour-Moth (*Ephestia Kuhniella* Zell) Fig. 1., which has also come to us from Europe, has been found in several mills in Ontario and various parts of the United States. It is a serious pest, as the larva clogs up the bolting cloths with its *webs* and prevents the flour from sifting through. The moth itself does no damage.

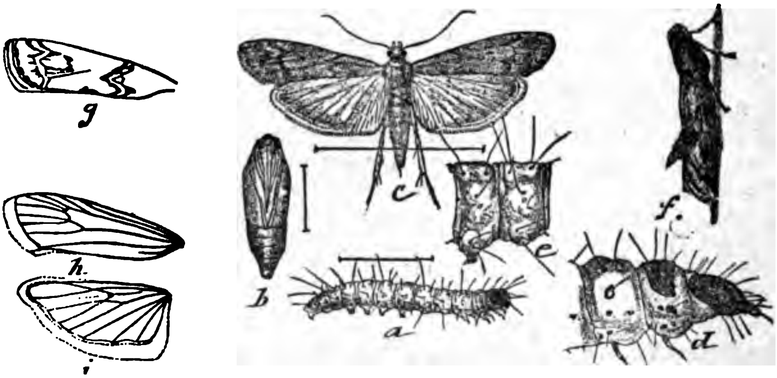


Fig. 1. The Mediterranean Flour-Moth ; *a* Caterpillar ; *b* Chrysalis ; *c* Moth, slightly enlarged; *d* and *e* enlarged details of Caterpillar ; *f* side view of Moth ; *g* markings on forewing ; *h* and *i* venation of wings.

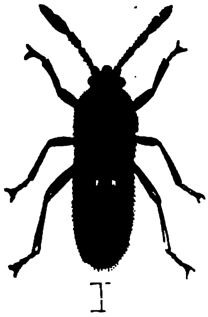


Fig 2. Chinch-bug magnified; the hair line below shows natural size.

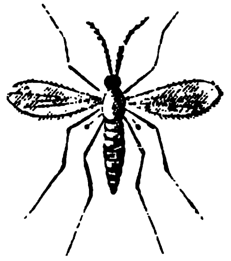


Fig. 3. Hessian Fly greatly magnified.

The Chinch-bug (*Blissus leucopterus*) Fig. 2, caused a loss in the State of Illinois alone of seventy-three millions of dollars in a single year by its destruction of corn and wheat crops. It is now controlled to a large extent by means of a fungous disease which is disseminated by distributing affected individuals wherever the bug is numerous. Fortunately for us this insect is rarely found in Canada and has never done any harm to our crops.

The Hessian Fly (*Cecidomyia destructor*, Say) Fig. 3, is doing considerable damage in the wheat fields of Ontario to-day. In some parts of Manitoba it is also doing great injury, destroying from five to twenty per cent. of the crop. There it has only one brood in the year, but here and further south there are two.

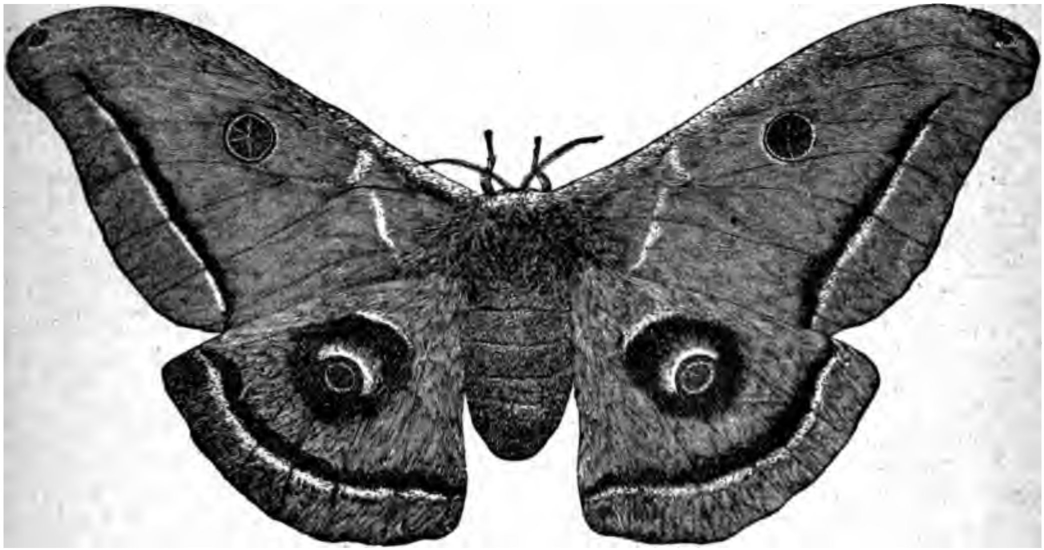


Fig. 4. Polyphemus Moth, female, natural size.

The Polyphemus Moth (*Telea polyphemus* Linn) Fig. 4, a very handsome insect, whose larva feeds largely upon elm. The caterpillar eats out a large portion from one side of a leaf, and, when resting, fills the space with its body. The colour matching that of the leaf, and the serrated outline of the creature's back corresponding closely to the original leaf, afford it a remarkable protection against ordinary enemies.

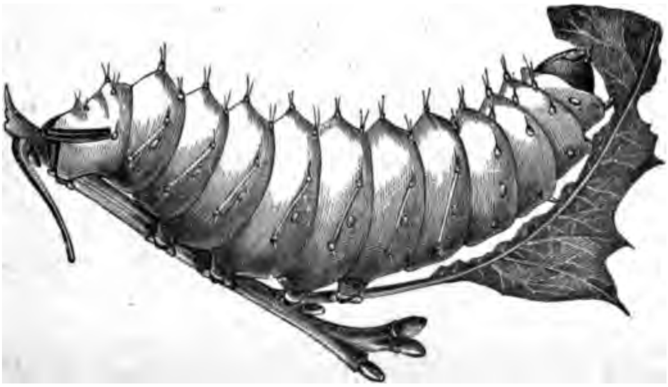


Fig. 5. Polyphemus Caterpillar.

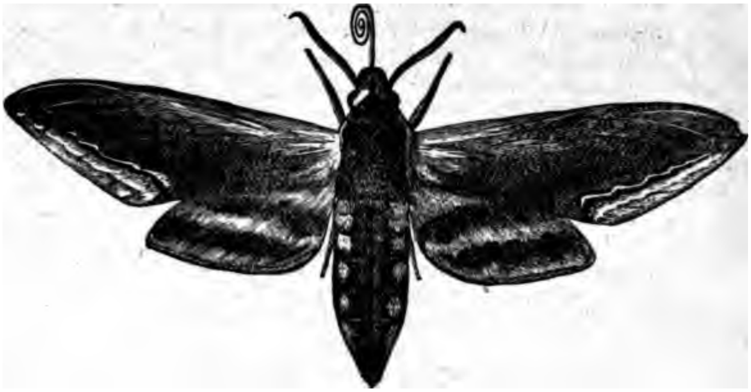


Fig. 6.) Sphinx drupiferarum, natural size.

The Plum Sphinx (*Sphinx drupiferarum*, Sm.-Abb) Fig. 6, whose larva is furnished with a stiff bristly tail, erroneously supposed by ignorant people to be a poisonous sting.

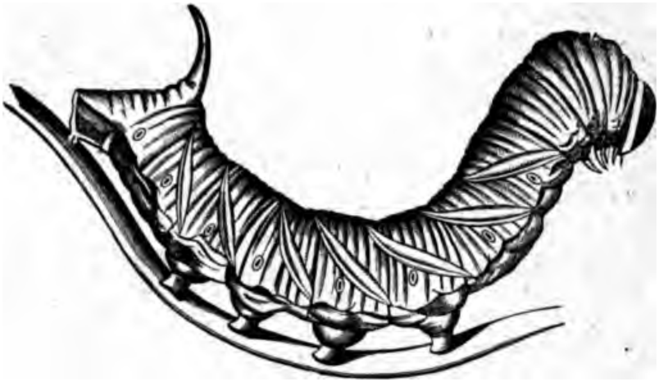


Fig. 7. Sphinx drupiferarum larva.

The Yellow-necked Apple tree Caterpillar (*Datana ministra*, Drury) and several other interesting species of insects were next exhibited and briefly described. The closing picture displayed the extraordinary chrysalis of an African butterfly which bears a striking resemblance to the face of a monkey. The lecturer regretted that he was unable to obtain an illustration for the lantern of a similarly grotesque chrysalis found in this country, that of the well known butterfly *Feniseca Tarquinius*, Fabr., whose larva feeds upon the woolly aphis of the alder.

The following paper was then read by Professor Webster :

ONE HUNDRED YEARS OF AMERICAN ENTOMOLOGY.

By F. M. Webster, Wooster, Ohio.

This is an appropriate year for retrospections ; and why not in the science of entomology as well as elsewhere ? Why may we not stand on the threshold of a new century as the footman who has made his way over the snow-clad prairies, and, at setting sun, faces about and follows with his eyes the stippled, undulating line of tracks that marks his wanderings over the plain of glistening white ? Mayhap, as the wanderer turns again to resume his journey, it will be with renewed vigor and encouragement that will support him in his onward course. And yet the illustration is, in some respects, inapplicable to the case in point, as the entomology of 1899 contains not only all of the knowledge that is being accumulated in regard to the science at the present time, but all that has come down to us through the past. The results of a piece of entomological work, carried out at the present time, represent not only what the present author has himself accomplished, but the best that has gone before, precisely as the four monster battleships, two Russian and two American, now in course of construction in the Cramp shipyards at Philadelphia, represent not only the triumphs of modern ship building, but the lessons taught by the failures and successes of hundreds of years of ship building. As entomologists we are now working, not alone with our own light, but with our own plus that of all that has been done before us, or so much thereof as has not been eliminated by the siftings of time as the dross is eliminated from the pure metal by the crucible. But for the labors of those who have gone before us, crude though such may now appear, the present status of the science could not now be possible. He that does his best in his day and generation will have little to regret thereafter.

Going back to the beginning of the present century, we find the science ef entomology but little more than in embryo; even in England and Europe, it was still in a very primitive state as compared to the present. Up to about 1775, all information relative to American insects was only obtainable by collections being made in this country, and sent over to England, France or Germany, for determination and description. Thus it came about that original descriptions of many of our species of insects, especially the more common ones, are to be found in foreign publications, and the types of these species are scattered through the collections and museums of England and Europe. In fact, during the latter half of the last century and the beginning of the present, this was the only course possible to pursue, as there were no collections or libraries in this country, and the educational institutions were exclusively classical in their nature. Even so late as 1815, Harvard offered no direct instruction in natural history, except in the lectures of Prof. Peck, and for these an extra fee was charged, while, when Thomas Say went to the Philadelphia Academy of Science, in 1812, he found a company of men had founded it with a view to anything but the advancement of science, and the collections consisted of some half dozen specimens of common insects, a few madrepores and shells, a dried toad and a stuffed monkey. But the facilities for securing entomological material from this country, by foreign entomologists, must have been exceedingly slow and unsatisfactory. A few specimens brought home by a returning traveller, or secured through the hands of captains of ships or from army officers, were probably the channels through which the major portion of the material was obtained. Even the American post was slow and expensive, and it was often necessary for entomologists to wait for months until some friend happened to be going in the right direction, and could be prevailed upon to carry letter and specimens to a fellow worker, The correspondence of all of the early workers in entomology indicates very clearly, how much they were hampered by these deficient methods of communication. Even so late as 1831, Dr. T. W. Harris wrote as follows, in some remarks appended to his catalogue of the insects of Massachusetts: "Should any young sons of New England have the inclination to turn their attention to this interesting branch of natural history they must for want of neceessary books on the subject remain in ignorance of the labors of their European contemporaries; and although they may have discovered many curious and valuable facts respecting our insects, they must resign to foreigners the honor of making known the objects of their investigations."

In view of the foregoing, then, it is not surprising that the close of the last century should have found so little accomplished in entomological research in America, and that except for an occasional fragmentary paper published in some local journal, or at best in the transactions of some semi-scientific body, there had been but two contributions to the knowledge of American insects and one of these was published in England, being entitled to consideration here because of its relating wholly to American insects. The first of these was entitled "Natural History of the Slug-worm," a pamphlet printed in Boston in 1790 and written by Professor Peck, and for which the author was awarded a premium of $50.00 and a gold medal by the Massachusetts Agricultural Society. The second was published in England in 1797 and was entitled "The Natural History of the Rarer Lepidopterous insects of Georgia," by J. Abbot and Sir J. E. Smith and comprised two folio volumes with 105 colored plates.

Thus it will be seen that, whatever collections had been made in America, these were in foreign hands, and the descriptions published in foreign literature, and it was under these conditions that the present century found the science of entomology. But, two events had transpired which, though giving no indication of their future effect, were to start the science, both pure and applied, in that forward movement that has resulted in its present condition.

On July 27th, 1787, there was born in Philadelphia, to Benjamin Say and wife, a son, who was afterwards named Thomas. On November 12th, 1795, in Dorchester, Massachusetts, there was born to Thaddeus Mason Harris and wife, a son, who was afterwards named Thaddeus William. The first of these was the son of a Quaker physician and apothecary, and the other the son of a Congregational minister. With these two lads, who at that time gave little indication of their future greatness, and the state of affairs that I have indicated in the foregoing, began what might well be termed the first century of American entomology.

Ere the present century had been ushered in, there had been serious depredations of insects, and now, with the establishment of an agricultural press there came communications and discussions regarding the nature of the insects implicated in these ravages. These contributions came from both the north and the south, and westward from beyond the Allegheny Mountains, but there was none to throw scientific light upon any of the problems involved. No one to identify the species of insects that were engaged in depredations, or to furnish the information that would enable the people to understand their habits, or to determine whether there were one or several kinds engaged in the work of destruction. There was chaos. Who was there that would from out of this bring system and order?

The boy, Thomas Say, had proved an indifferent pupil; had been taken from school and placed in his father's shop; then started in business and ended in bankruptcy. From boyhood he had taken the greatest delight in collecting insects and he now turned his back as it were on business and began the work that was to make his name familiar throughout the world where natural science was studied, and give him the well-earned title of "The Father of American Entomology." About 1817 he began to publish the results of his studies and continued up to the time of his death in 1834. Though his work was incomplete and has been in some cases criticised for its want of accuracy, yet it was the foundation of the technical branch of the science in America.

The boy Thaddeus W. Harris, on the contrary, seems to have been studious but not at all inclined towards natural science. While at Harvard, from 1811 to 1815, he seems to have developed a taste for entomology which appears to have been stimulated by his friend and instructor, Professor Peck. It is interesting to note that his studies, even at an early date, began to take a somewhat different course from those of Thomas Say in that he became interested in the habits of the insects which he studied. He began to collect insects as early as 1820 and, as he tells us, soon became impressed with the great need of a manual of American entomology. This was doubtless the primitive idea that later led up to his work that has become classical, viz., his "Insects Injurious to Vegetation;" published in 1841 and reprinted in 1842, and again in a revised form in 1852. Though this embodied the results of long years of patient labor under the most discouraging circumstances, the author received from the State for his labor the munificent sum of $175.00. This work was to the applied science what Say's American Entomology was to the pure, viz., the foundation; and if Thomas Say was the "Father of Technical Entomology," then T. W. Harris is fully entitled to the honor of being called the "Father of Applied Entomology" in America. To these two men we owe the inspiration that has induced many an entomologist to commence his studies and encouraged him and sustained him in his later work. They were the pioneers of that period extending from 1800 to the death of Say in 1834, and and in the case of Harris this period continued up to 1855, his last paper on the Rose Bug (*Macrodactylus subspinosus*) appearing in the Boston Cultivator on September 8 of that year. It was Dr. Asa Gray, I believe, that wrote of Harris: "Of other genuine naturalists I have read but he is the only one I ever saw."

While Thomas Say has come to be honored by the title of "Father of American Entomology," he had already himself bestowed that or a similar title upon Rev. F. V. Melsheimer, and in his "American Entomology" he calls him the "parent of entomology in this country." In 1806, so far as I am able to determine, Rev. F. V. Melsheimer published the first general catalogue of North American coleoptera. In 1842 the Entomological Society of Pennsylvania was formed for the purpose of giving an impulse to the study of entomology by bringing together the cultivators of the science and preparing a catalogue of the coleoptera of the country. Owing to the fact that many species of coleoptera had been described in England and Europe, as well as in this country, and many species were to be found in the cabinets of American collectors without names, there was almost utter confusion and it was thought that a catalogue of all described species would, in a measure at least, reduce this chaos to system and facilitate the further study of this interesting order of insects. Accordingly the preparation of this catalogue was assigned to Dr. F. E. Melsheimer, son of Rev. F. V. Melsheimer, author of the first catalogue. This was prepared for publication and afterwards revised and enlarged by Dr. J. L LeConte and S. S. Haldeman, and published in 1853 by the Smithsonian Institution. And from this has evolved our check lists of North American Coleoptera.

After the death of Thomas Say in 1834 several gentlemen took up the work and as there had been several scientific bodies organized, and the publications of these offered facilities for printing the results of their labors, a considerable impulse was offered to the advancement of the science. Among these workers was Maj. LeConte and later his son, Dr. John L LeConte, who afterwards did so much for American coleopterology; Dr. S, S. Haldeman, Professor N. M. Hentz. Dr. Christian Zimmerman and Edward C. Herrick. Among the work of foreign entomologists as related to American species we note especially that of Rev. Wm. Kirby, who was the author of that portion of Sir John Richardson's "Fauna Boreali-Americana" which treats of insects. This contained descriptions of no less than 447 species of Canadian insects, especially coleoptera, and was published in 1837, having since been revised and republished in the "Canadian Entomologist" by Dr. Bethune. In 1840 Mr. P. H. Gosse published in England a list of 26 butterflies, 43 moths and a number of other orders, 14 of which were figured. It was with these advances and in this condition that the beginning of the last half of the present century found the science of entomology in America. There was great confusion in regard to species and this seemed to prevent any rapid progress, both in the pure as well as the applied science, for the latter must always await the advance of the former. As I have stated, the Smithsonian Institution, by the publication of Melsheimer's Catalogue of the Coleoptera, greatly assisted workers in that order of insects but the good work stopped there and it was nearly five years before other orders were similarly treated in the publications of this institution.

The new and beautifully illustrated edition of Harris's Insects Injurious to Vegetation gave this work a renewed value and popularity, especially among the agricultural classes. In 1854 there appeared a series of volumes illustrating the agricultural and natural history of New York. Volume V. of the series was devoted to the more common and injurious species of insects. It is a large quarto volume profusely and brilliantly illustrated, but one for which entomologists have not been able to find any particular use.

In 1855 Dr. Asa Fitch received the appointment of entomologist to the New York State Agricultural Society, the Legislature having made provision for the establishment of the office which was synonymous with that of State Entomologist. The selection of Dr. Fitch was a wise one, and he promptly began to take up the work so well begun in Massachusetts by Dr. Harris, and for fourteen years his annual reports went out not only to aid the farmer to cope with injurious species, but also to aid the more technical entomologist, as a considerable number of the original descriptions of our insects are to be found therein. In 1856 the Canadian Bureau of Agriculture and Statistics offered prizes of £40, £25 and £15 for the best essays, respectively, on the "origin, nature and habits, and the history of the progress from time to time,—and the cause of the progress—of the weevil, Hessian fly, midge and other insects as have made ravages on the wheat crops of Canada; and on such diseases as the wheat crops have been subject to, and on the best means of evading or guarding against them." The first prize was awarded to Professor H. Y. Hind of Trinity College, Toronto, and his Essay on the Insects and Diseases of Wheat appeared in 1857, being the first publication relating to applied entomology, issued by the Canadian Government. In the meantime, the United States Department of Agriculture had secured the services of Mr. Townend Glover, an Englishman, born in Rio de Janeiro, South America, in 1813, and who, after much wandering about, had finally settled in the United States, about 1836. June 14, 1854, Mr. Glover received his appointment "For Collecting statistics and other information on seeds, fruits and insects in the United States" This was just about the time that the new Bureau of Agriculture was established, and attached to the United States Patent Office, and the Report of the latter for the year 1854 contains the first of a series of reports, on various insects injurious and beneficial to vegetation, though this was the exact title of the first only. The reports for 1854 and 1855 are fully illustrated. In the winter of 1856-57, Mr. Glover was ordered to British Guiana and Venezuela, and there is nothing from him in the Patent Office report for 1856; but in 1857 he again appears, though his articles are also signed by the Chief Clerk, D. J. Brown, by initials only, and this is true of the reports of the Patent Office for the years 1858 and 1859. The entomological paper for the year 1860 was prepared by Mr. P. R. Uhler of Baltimore, Md. Although Mr. Glover was not in evidence in these documents at this time, he was not idle, as will appear later. But the Government had now taken the initiatory step and recognized economic entomology. In the meantime Dr. William LeBaron of Illinois, afterwards State Entomologist of that State, began the publication of contributions on Injurious and Beneficial insects, in the "Prairie Farmer" in 1850, and continued to do so until 1874, two years prior to his death. Miss Margaretta Hare Morris, who began to study the habits of injurious insects in 1841, continued her work and publications up to 1860. Thus it will be seen that the applied science was making rapid strides, not alone as to the study of insects themselves, but in the diffusion of the knowledge gained by these studies, among the horticultural and agricultural masses, and the literature of these industries at this period is even now very interesting to economic entomologists. One can scarcely prepare a paper on many of our common insects without referring back to the volumes of the Prairie Farmer, The Country Gentleman, The Canadian Journal, The Canadian Naturalist and Geologist, and others of that character.

But how about the pure science? Has that branch been allowed to fall behind and the workers therein become discouraged? Though discouraged they probably were, many times, yet there does not appear to have been any lagging behind or giving over to despair. Dr. John L. LeConte did not terminate his labors with the preparation of Melsheimer's Catalogue of the Coleoptera; but the volumes of the Proceedings of the Philadelphia Academy of Science from 1852 to 1865 are filled with his descriptions, and, besides, there were many papers published in the Transactions of the American Philosophical Society, and other similar publications. In 1857, Baron R. Osten Sacken, of the Russian Legation at Washington, having been interested in the Diptera, at the solicitation of the Smithsonian Institution, prepared for publication a Catalogue of the described Diptera of North America, and including the West Indies, Central America and Mexico. In his preface to this Catalogue, which was published by the Smithsonian Institution, in 1858, Baron Osten Sacken expresses the hope that it will encourage the study of the Diptera, as rapidly as Melsheimer's Catalogue of the Coleoptera had furthered the study of that order of insects. In continuation of this work on the Diptera, there appeared, from the same Institution, in 1862, Part I, of the Monographs of the Diptera of North America, by H. Loew, edited, with additions, by Baron Osten Sacken. Part II, of the same series, appeared in 1864; Part III, by Dr. Loew alone, in 1873, and Part IV, by Osten Sacken alone, in 1869. Dr. John G. Morris, an entomologist of Baltimore, had been gathering materials, and in 1860 the Smithsonian Institution published a Catalogue of North American Lepidoptera, and a Synopsis of American Lepidoptera to accompany this, in 1862, though Part I only was published. In 1861, a synopsis of the Neuroptera of North America, by Dr. H. Hagen, LeConte's Coleoptera of Kansas in 1859, his Classification of Coleoptera of North America in 1862, his List of the Coleoptera of North

America, Part I, in 1866, his New Species of North American Coleoptera, in the same year, and Part II of both of these, published in 1873, together with the Catalogue of Orthoptera of North America, by S. H. Scudder in 1868, all printed by the Smithsonian Institution, show an amazing amount of activity among entomologists, during a decade when there was supposed to be little time for science, except that of war. Dr. LeConte himself dropped his studies, and went to the front to care for the sick and wounded, and give to the country his professional services. Dr. Breckenridge Clemens had published his admirable Synopsis of North American Sphingidæ in 1859, in the Journal of the Academy of Sciences of Philadelphia, and also during the same year a paper on the Arctiidæ in the Proceedings of the same institution. Others had published papers in the publications of the American Philosophical Society, the Boston Society of Natural History, and the New York Lyceum of Natural History. The various Explorations and Surveys, carried forward by the United States Government, for various purposes, furnished opportunities for making collections in the newer portions of the country, and the folio volumes dealing with the results of these expeditions are filled with valuable entomological papers.

In 1861 the Entomological Society of Philadelphia began the publication of its proceedings, the Society itself having been chartered in 1862, and six volumes of these were issued prior to 1866, when it was changed to the American Entomological Society, the transactions of which have been published quarterly up to date. In the first series, as above indicated, are found exhaustive papers by all of the most prominent entomologists of the times. In the first volume will be found the name of William Couper, and in the second that of William Saunders, among the contributors. Surely it cannot be said that there was any lack of activity during the fifth and sixth decades of the present century, among technical workers in entomology. But this is by no means all that had been accomplished. In 1862 there appeared, in the *Canadian Naturalist and Geologist*, a list of thirty-six persons, resident of Canada, who were interested in entomology, the list having been prepared by Dr. Bethune and Mr. William Saunders. On September 26th, 1862, ten of the gentlemen, whose names appeared in the above mentioned list, met in Toronto to consider the matter of a definite organization, This, however, was not accomplished until April 16th, 1863, when the Entomological Society of Canada was organized. The September meeting in Toronto was the first meeting of entomologists to be held in Canada, and you will pardon me the disgression if I call attention to the fact that on August 30th, 1889, there was also in Toronto another entomological society born, viz., the Association of Economic Entomologists, a body that was destined to include in its membership, not only every American economic entomologist, but every foreign worker in the applied science. No other society or organization has done so much to bring the workers in the world, in the science of applied entomology, together, in influence and effort, as has this one. No similar organization of the kind exists, and it has been of immense advantage to workers in the applied science in almost every country where entomology is known as a science. To Toronto then, must go the honor of being the birthplace of two of the most important entomological organizations in America. The Canadian Entomological Society, after seven years, was incorporated in 1871, under the name of "The Entomological Society of Ontario," and I esteem it a high honor to be allowed to address you at this its thirty-sixth annual meeting. The Quebec and London branches were established in 1864, and that of Montreal in 1873. In 1864 the newly organized Society published a list of 144 species of Canadian lepidoptera, followed in 1865 by a list of 350 additional species. In 1867, a list of 1231 species of coleoptera was issued, being ten times the number enumerated by Mr. Couper twelve years previously. In August, 1868, was issued the first number of "The Canadian Entomologist." Other similar periodicals have come and gone, with but two exceptions, viz., "Psyche" and "Entomological News," the first of which appeared in 1874, published in Cambridge, Massachusetts, and the second in 1890, and published in Philadelphia, Pennsylvania. Thus, the Canadian Entomologist spans almost one-third of the century of which I am speaking, and its columns have, from the first, been filled with original matter by almost every American entomologist of note living during this entire period. Its pages have been open alike to the technical and applied science, and the series of volumes constitute a history of entomology in America, during this period. The first editor, Dr. Bethune, had had an eight year's training as entomological editor of the *Canada Farmer*, and was all the more fitted for the difficult task of editing an economic and at the same time technical entomological journal, and the result has been so satisfactory that I do not remember having heard of a single significant criticism being offered against either the publication itself or the nature of its contents. The entomologists of America owe to both Dr. Bethune and Dr. William Saunders a debt of gratitude for their faithful editorial labors. The twenty-nine annual reports of this Society are of great value, though not so free from compiled articles as is the "*Canadian Entomologist.*" In 1865, the Entomological Society of Philadelphia began the publication of the "*Practical Entomologist,*" with Mr. Benjamin D. Walsh, of Rock Island, Illinois, as associate editor at first, and later as editor. The publication was a very useful and valuable one, being, as the title implies, a strictly practical journal, but it was short lived as but two annual volumes were published. In 1868, that exceedingly valuable publication, the *American Entomologist*, was begun under the editorship of Benjamin D. Walsh and C. V. Riley, the former being killed by an accident soon after the close of the first volume. Unfortunately, this too was suspended at the end of the second volume, to be resumed again in 1880, when another volume was issued by Dr. Riley, and then it expired for good. In 1878, the *Bulletin* of the Brooklyn Entomological Society, was started, and six valuable though rather small volumes were published, when this, too, ceased to exist, being, with "*Papilio,*" a magazine devoted exclusively to lepidoptera, and published in New York City, and comprising four volumes extending from 1881 to 1885, merged into "*Entomologica Americana.*" But this last, at the end of the sixth volume, after the fashion of the others, gave up the ghost. There is much that is valuable to be found in all of these publications, and they mark the growth of the science during the period of their existence. Not a few of the younger of our entomologists sent to them their maiden communications though there are no lack of papers by the oldest workers to be found among them. All of these entomological periodicals, including the "*Canadian Entomologist,*" had their influence in encouraging the study of insects especially among young men, in much the same way that the entomologist's contributions to the agricultural and horticultural press have resulted in a closer attention to and a better knowledge of the common destructive insects by our intelligent up-to-date husbandmen.

The activity in the pure science has not been greater than in the applied. Valuable entomological papers by Uhler and S. S. Rathvon are to be found in the reports of the United States Department of Agriculture for 1860, 1861 and 1862, when Mr. Glover was re-employed, this time as Government entomologist, and up to 1878, each annual volume of the Departmental reports contains instructive papers on insects. The author himself derived much aid and encouragement from the paper on "The Food and Habits of Beetles" in the report for 1868. I can only call attention to that other immense work of Mr. Glover, viz., "Manuscript Notes from my Journal, or Illustrations of Insects," with the complete set of illustrations comprising 273 quarto plates, with 6,179 figures engraved on copper. A few institutions in the country have been able to secure a full set of these plates, colored by a competent artist. In 1867, a bill was passed by the Legislature of Illinois authorizing the Governor to appoint a State Entomologist. Through some technicalities he was not appointed, though the Governor recommended Mr. B. D. Walsh for the position; this gentleman would have been made State Entomologist in 1870, but for the terrible accident, on November 12th, 1869, that cost him his life. As it was, he was acting state entomologist at the time of his death, and in that capacity issued his first report. In 1870, Dr. William LeBaron was appointed state entomologist and held the office for four years, issuing in this time four annual reports. In 1875, Dr. LeBaron was followed by Dr. Cyrus Thomas, who held office until 1882, issuing in the meantime, six annual reports, when he was succeeded by Dr. S. A. Forbes, the present incumbent, whose reports contain the results of original work almost exclusively. In 1868 Mr. C. V. Riley was appointed State Entomologist of Missouri, serving in this capacity until 1877, when the office was abolished. The nine annual reports published during this period, by Dr. Riley, are classics in American literature of applied entomology. In 1880, Dr. J.A. Lintner was appointed State Entomologist of New York, in place of Dr. Asa Fitch, resigned, and held the office until his death in 1898. While Dr. Lintner could hardly be termed an investigator, his series of carefully compiled reports, relating to the insects to which his attention had been called from time to time, afford a veritable encyclopedia of entomological information, for which more than one worker has felt devoutly thankful. In 1869, Dr. A. S. Packard, who had previously sent out some excellent entomological literature, issued his "Guide to the Study of Insects," the first work of its nature to be issued in America. In 1876, came his big folio volume, "A Monograph of the Geometrid Moths," from the United States Geological Survey, and lately we have had his "Bombycine Moths" and his "Text-book on Entomology," both of which are masterpieces. In 1877, the United States Entomological Commission was organized by an act of Congress, and placed under the authority of the Secretary of the Interior, afterwards being transferred to the Agricultural Department, its members comprising Drs. C. V. Riley, A. S. Packard and Cyrus Thomas. The object in creating this commission was to study the Rocky Mountain locust, but the members did not confine their investigations to these, by any means, and, as a result, we have several bulletins and five octavo reports, the latter containing over 3,200 pages, with 165 full page plates and a great number of smaller illustrations, and 10 large maps. The fifth and last volume was prepared by Dr. Packard, and relates to forest insects exclusively. In 1878 Dr. Riley was appointed United States Entomologist, but held the position for only one year, when he resigned, having in the meantime issued one report. The following year, Prof. J. H. Comstock was appointed to the office which he held three years, issuing two valuable reports and a special report on cotton insects. Since that time Prof. Comstock has given us some most excellent publications. His work on the Coccidæ is known universally among specialists of that group, while his later works "Insect Life" and "Manual for the Study of Insects," have been of great value to students and amateurs. In 1881, Dr. Riley was a second time called to the office of United States Entomologist, serving in that capacity until 1894, organizing a corps of original investigators, the like of which had not before been known in the history of the science. During these years the annual reports, bulletins and the serial "Insect Life" almost constitute in themselves an entomological library. The influence and zest that was thus given to the study of the applied science, and especially in the case of Experiment Station entomologists, can hardly be calculated. On the death of Dr. Riley the office of United States Entomologist very properly and deservedly fell to his long time first assistant, Dr. L. O. Howard, who has not only held the office creditably, but in some respects improved upon his predecessor. At the time of his death Dr. Riley was Honorary Curator of the Department of Insects, in the National Museum of Washington. Dr. Howard also succeeded his superior here, as in the Division of Entomology, but instead of a single aid, as under Dr. Riley, there is now a corps of conscientious, hard-working specialists, whose labors cannot prove other than creditable to American entomology.

In 1888 came the establishment of Experiment Stations, under the Hatch Act, and the office of Station Entomologist has been created in the majority of these institutions, which office is similar to that of State Entomologist, except that, in many cases, the entomologist is called upon to assume the duties of other departments of science, like botany or horticulture, or else devote a larger proportion of his energies to teaching in the Agricultural Colleges. This condition of entomological interests, in the Stations, has necessitated much hurried compilation and attempts towards popularization of old and well-known facts. so that the entomological bulletins of Experiment Stations do not stand as high in the estimation of scientific men as they otherwise would. Nevertheless, this is hardly the fault of the entomologists, but in the management of these institutions themselves, and besides, when we come to sift out the chaff, there remains much in the results of their work that is new and valuable. The workers themselves are too numerous for me to mention here. Theirs is current history, and their works will speak more for them than any words of mine possibly could. In Canada, Dr. Saunders's "Insects Injurious to Fruits," issued in 1883, with a second edition in 1892, has been a wonderful public educator, in applied entomology, and the working entomologist will find that a copy at his elbow will be of the greatest service. It is one of the very best of its class that has ever gone out from the hand of an American entomologist. In 1887 Dr. James Fletcher was appointed Dominion Entomologist and Botanist and his work has been a herculean one. While he has given out annual reports, we all know full well that these but poorly represent his labor. What can one mind and one pair of hands do in such a sea of work as there is in Canada? It is like attempting to lower Niagara River by dipping the water out of Lake Erie with a teaspoon. You ought to have Dr. Fletcher, and a corps of at least half a dozen well-trained and experienced entomologists, and God speed the day when you may have them.

But I must go back and mention a few others whose work has helped to make American entomology what it is to-day. As long as our Noctuidæ are known and studied, the name of A. R. Grote will be associated therewith, just as will the name of that gray-haired hero (if heroes there be among entomologists, and if not, why should there not be?), William H. Edwards, whose monumental work on the butterflies we may well be proud of, and which, except for Scudder's "Butterflies of the Eastern United States," is unique in our entomological literature. Then there is the work of Clemens, Chambers, French, Fernald and Robinson, as well as others that I have not time to even mention, but who have made their reputations among us. In the Coleoptera there was Dr. Horn, who, either associated with Dr. Le Conte or independently, has done as much or more for American coleopterology than anyone else, although there are others whom I might mention. The life-work of Mr. S. H. Scudder is a good example of American activity, as, besides his work on the insects of the present age, he has given the world as well as America such monographs on fossil insects as have never been done before. But time will not allow me to say more, except to mention the industrious labors of Abbé Léon Provancher, and his "Le Naturaliste Canadien," a work that was carried out under discouragements that the most of us cannot appreciate or understand.

In looking back over the field, then, there appear several conspicuous achievements in applied entomology that rise up, like the cloud-capped eminences of huge mountains, from the comparatively level plain. The spraying of fruit trees, bushes and vines to destroy insect pests is an innovation that has saved America millions of dollars annually. The work of the Massachusetts Gypsy Moth Commission is a revelation to those who have never investigated its wonders and merits. The introduction of beneficial insects, both as a means of destroying the destructive ones, and for the purpose of fertilizing the bloom of exotic fruits or plants, is another modern innovation. It will be remembered that, ten years ago, the orange groves of California were threatened with destruction from the Cottony-Cushion Scale, *Icerya Purchasi*, Maskell. After much correspondence with Mr. Frazer S. Crawford, of South Australia, one of the kindliest and most lovable men that it has been my good fortune to meet, and who, except Dr. Riley himself, did more than anyone else to further and bring about the introduction of the natural enemies of the Icerya into California, Mr. Albert Keobele was sent to Australia in order to introduce the insect enemies of this pest into this country. How this was accomplished and the results that were obtained has been told again and again, and covered with glory, not only the United States Department of Agriculture and the State Board of Horticulture of California, but quite properly Mr. Keobele as well. It is, however, but just to say that Mr. Crawford not only was very influential in furnishing the information necessary to the undertaking, but himself forwarded the first *Dipterous* parasites *Lestophonus iceryæ* to this country, and did everything possible to assist the entomologists that afterwards visited South Australia; and for American entomologists to forget for a moment, his connection with the undertaking would be most deplorable. As you know, this introduction of Mr. Keobele's was successful, and similar experiments in sending the *Novius cardinalis* to other countries has also been crowned with success. But another achievement came from the studies of this scale, viz., the application of hydrocyanic acid gas to destroy scale insects. This last honor falls to Mr. D. W. Coquillett, now of the National Museum. Although in a sense forestalled by the introduction of the humble bee into New Zealand to fertilize the bloom of red clover, *Trifolium pratense*, yet the recent success in introducing and establishing *Blastophaga psenes* into California to fertilize the Smyrna fig adds a well-deserved honor to the office of United States Entomologist at present so creditably filled by Dr. L. O. Howard.

Although important from an educational rather than an economic or technical standpoint, nevertheless I cannot forego calling attention to Dr. W. J. Holland's "Butterfly Book" as paving the way for a better method of presenting the science of entomology to the young or inexperienced. That it should be possible to place such a superb book as this in the hands of our young people, and withal so entertaining, at the price of $3.00, is an innovation in teaching our beloved science.

And now, standing as we do on the threshold of a new century, it does seem as though we might look back over the last with honest pride. From almost nothing we have become the leaders of the world in applied entomology, and we are certainly not exasperatingly far behind in the pure science. International questions of the technical sort have, many of them, yet to be settled, and we may find, after all, that we are not less in error than our fellows in other lands. At any rate, we have accomplished enough to give us the best possible encouragement for future labors, and it is to be hoped that the white-haired veterans that are still with us, and have done so much to make this condition of affairs possible, will live many long years to watch and enjoy our further progress.

As to the future, it seems to me that the work of the entomologist will differ somewhat from that of the past. Except in some groups most of the descriptive work is done, and all that remains is to prove the validity of species, for we have learned one other thing in the past, and that is, that the Almighty can make a better species than the entomologist, though probably nowhere near as many of them. Canada will probably offer a more fruitful field for the collector, for some time to come, than the United States, because it has been less worked, but you also have problems in distribution, variation, development and inter-relations with other organisms, and it is in these directions that I expect to see the science making the greatest progress. If we have a world conquered behind us, there are others in front us to conquer. There is something and enough for everyone to do, and do well. May the Entomological Society of Ontario and its members live long and continue to work faithfully, for the fields are crying out for workers, and the prospects encouraging, and as I have stated before, entomology knows no political lines, but is as boundless as the ocean and as free as the air. So may it ever be.

At the close of Prof. Webster's paper, which was listened to with great attention, another address illustrated with lantern pictures, was given by Prof. Lochhead.

LECTURE ON SOME COMMON INSECTS OF THE ORCHARD, GARDEN AND FARM.

The speaker first dealt with the Scale insects which occur in many orchards, and do a vast amount of harm. The San Jose Scale, the Oyster-shell bark-louse, the Scurfy bark-louse, and the plum Lecanium were each in turn described from the lantern illustrations. The general adoption of spraying with whale-oil soap (2 lbs. to 1 gallon of water) during the dormant season would soon keep the majority of these small scale insects in check. To insure further immunity the speaker advised the use of dilute kerosene emulsion spray during June when the young forms (if any survive) are moving about.

The Codling worm and the Bud worm were next discussed. Their habits and life histories were concisely described, as well as the remedies which were used against them. The insect pests which make webs or tents, viz.: the fall web-worm, and the two species of tent caterpillars, were described, and remedies given, which, if applied properly, would certainly diminish the damage done by these very injurious moths. The use of Paris green spray is recommended while the worms are small, but much might be done by handpicking the egg-masses of the tent-caterpillars during fall and winter.

The borers, the flat-headed and the round-headed forms could be controlled by the application of a tar wash to the trunks of the trees after many of the worms had been killed by probing the tunnel with a stout wire.

The pea-weevil was described as a very serious pest, for probably one-half of the pea crop of Ontario was destroyed by its ravages. Its life-history was sketched and the carbon-bisulphide remedy was mentioned as probably the most effective.

Among garden insects the Colorado potato beetle, the cabbage-worm, the white grub, and the wireworms were illustrated, and remedies given for their control.

Finally, the speaker dealt somewhat fully upon a few beneficial insects which are too often killed by the farmer and gardener, named, the *lady-birds*, which prey upon plant lice and scale insects, and the *ground beetles* which feed upon grubs in the soil, and even climb trees in search of food. The speaker spoke strongly of the necessity of recognizing the beneficial from the harmful insects, if the best results are to be attained in the warfare against insect pests.

The proceedings were brought to a close by a few remarks from Dr. Bethune, who expressed the thanks of all present to those who had furnished them with such an agreeable and instructive evening. The majority of the audience then visited the Society's room in another part of the building where they were much delighted with the exhibition provided by Mr. Moffat, of many drawers from the Society's cabinets, filled with wonderful and beautiful insects of various orders. The success of the illustrated lectures was largely due to Mr. R. W. Rennie, who fitted up the lantern and manipulated the slides.

THURSDAY, OCTOBER 12th.

The session of the Society was resumed at 10 o'clock a.m., Dr. Fyles occupying the chair at the request of the President. The minutes of last year's meeting were adopted as printed in the annual report. The chairman then called upon the various officers of the Society and its Branches and Sections to read their respective reports upon the transactions of the past year. The first in order was that of the Council, which was read by Dr. Bethune, as follows:

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to submit its annual report for the year 1898-99.

The thirty-fifth annual meeting was held in Montreal in November last in order that we might join in the celebration of the twenty-fifth anniversary of the Montreal branch. It was well attended by members from a distance as well as by those resident in the city, and the proceedings were of a highly interesting and useful character. A full account has already been published, rendering it unnecessary to enter into details. The branches in Toronto and Quebec are also in a prosperous condition, and have been the means of largely increasing the membership of the Society.

The twenty-ninth annual report on economic and general Entomology was presented to the Minister of Agriculture for Ontario early in February last, and was printed and distributed at the beginning of May. It contained one hundred and twenty pages, and was illustrated with sixty seven wood cuts and two plates, portraits of Messrs. W. H. Harrington and J. Dearness, who have recently held the office of President of the Society. In addition to an account of the proceedings at the last annual meeting the report contains the address of the President, Mr. Henry H. Lyman and the following valuable and interesting papers: "Some economic features of international Entomology" and "The collector and his relation to pure and applied Entomology," by Prof. Webster; "The farmer's garden and its insect foes," by Rev. Dr. Fyles; "Entomology in Schools," by Prof. Lochhead; "The cotton boll worm in Canadian corn" and "Two avian parasites," by Messrs. R.

Elliott and J. Dearness; "A bit of history" and "Random recollections in Natural History," by J. A. Moffat; "The Noctuidæ occuring at Toronto," and "Muskoka as a collecting ground," by Mr. Arthur Gibson; "Notes on Papilio brevicauda," by Mr. A. F. Winn; "The Gypsy Moth," by Mr. E. H. Forbush; "The preparation of specimens for the exhibition of life histories in the cabinet," by Mr. Dwight Brainerd; "The brown-tail Moth" and "Injurious Insects in 1898," by Dr. Fletcher; and "Notes on Insects of the Year," by Messrs, Harrington, Evans, Kilman, Rennie, Hutt and Moffat. In the excellence of the papers and their generally practical character, the volume has well maintained its high standard of usefulness.

The *Canadian Entomologist*, the monthly magazine published by the Society, completed its thirtieth volume in December last. It consisted of 335 pages and was illustrated with six plates and twenty one original wood-cuts; the contributors numbered fifty-three. It was filled with original papers of a high order of merit, and may justly be considered one of the most valuable and interesting volumes since the inauguration of the magazine. Of the thirty-first volume ten numbers have now been issued, containing 304 pages, five plates and thirty-six wood cuts. Among the large number of valuable papers may be mentioned a series of articles on the "Classification of the Entomophilous Wasps," by Mr. William H. Ashmead; and numerous papers on Coccidæ, by Profs. Cockerell, and Tinsley, Messrs. King, Fowler, Parrott and others; a List of Manitoba Moths, by Mr. A. W. Hanham; a continuation of a series of papers by Prof. Wickham, on the Coleoptera of Canada, and Mr. E. M. Walker, on the Acridiidæ of Ontario; life histories of Lepidoptera, by Dr. Dyar; Descriptions of new genera and species in various orders by Messrs. Scudder, Quaintance, Coquillett. Skinner, Smith, Banks and others; and papers on a great variety of subjects of a techincal or practical character by leading Entomologists of America and several distant countries.

The council have learned with much satisfaction that an Entomological Society has been successfully organized in the North-West Territories of Canada, under the presidency of Mr. Percy B. Gregson, of Waghorn, Alberta. They desire to express their heartiest wishes for its success and prosperity and to assure its members of their readiness to co-operate with them in any way in their power. The field is a vast one and its scientific resources are as yet unexplored and almost unknown.

At the meetings of the Association of Economic Entomologists and the American Association for the Advancement of Science, held at Columbus, Ohio, in August last, the Society was represented by Dr. William Saunders, Director of the Experimental Farms of the Dominion.

The Council has watched with interest the vigorous efforts made by the Government of Ontario to prevent the spread of that dread pest of the fruit-grower, the San Jose Scale, and is pleased to learn of the success which has attained the experiments made by Prof. Lochhead in fumigating with hydrocyanic acid gas. It was gratified to learn that one of its members, Mr. J. Dearness, formerly President of the Society, was appointed by the Hon. the Minister of Agriculture, one of the Commissioners for the investigation of the ravages of the Scale in Ontario.

The members of the council are pleased to note the appointment of Mr. Arthur Gibson, President of the Toronto Branch of the Society, to the position of assistant in the Division of Entomology of the Dominion Experimental Farms.

As will be seen from the report of the Librarian and Curator some valuable additions have been made to the collections both of books and specimens.

All of which is respectfully submitted.

HENRY H. LYMAN, President.

REPORT OF THE LIBRARIAN AND CURATOR.

For the Year Ending 31st of August, 1899.

An important addition was made to the library during the past year, by the purchase of some of the more recent works in the various departments of the Natural Sciences, numbering 28 volumes; which will give the members of the different sections associated with the society an opportunity of consulting the latest and best authors in the particular branches of science to which their attention is being directed.

Twenty bound volumes were received from Governments, Public Institutions and Societies during the year.

Of the proceedings and transactions of Societies, Magazines and Pamphlets, there were made up and bound 25 volumes; 1 volume was donated to the library by Mr. Goodburn; making a total of 74 volumes added during the year. The full number on the Register is now 1,627. Books issued to local members numbered 50.

A few specimens of local interest, new to the collection, have been added during the year. An opportunity presented itself of obtaining some Manitoba Lepidoptera, correctly determined, which was secured, and will be—and has already been—of service in identifying other material.

Some interesting additions to the collection of exotics have been made at different times by Mr. C. T. Ramsden of Santiago de Cuba; one of our members at present resident there.

Respectfully submitted,

J. Alston Moffat.

Mr. J. A. Balkwill presented his financial statement as Treasurer of the Society and stated that the balance on hand would all be required to meet the ordinary expenditure during the remainder of the year.

AUDITORS REPORT.

Receipts and expenditures of the Entomological Society of Ontario for the year ending August 31st, 1899.

Receipts.		Expenditures.	
Balance on hand Sept. 1st, 1898	$ 739 25	Pins, Cork, etc	$ 91 04
Members' Fees	390 90	Annual Meeting and Report	285 25
Sales of Pins, Cork, etc.	89 23	Library	125 48
Government grant	1000 00	Printing	597 21
Advertising	13 00	Expense Account, (postage, etc.)	108 94
Interest	17 73	Salaries	300 00
Sales of Entomologist	34 11	Rent	200 00
		Balance on hand, August 31st, 1899	576 30
	$ 2284 22		$ 2284 22

We the Auditors of the Entomological Society of Ontario hereby certify, that we have examined the books and vouchers of the Treasurer and find them well kept and correct and the above is a true statement of the accounts of the Society.

London, Sept. 15th, 1899.

W. H. Hamilton,
James H. Bowman, } Auditors.

A discussion on the subject of the purchase of a Magic Lantern was introduced by Mr. John Law, who thought that the Society ought to have one for exhibition purposes. Prof. Lochhead gave some information regarding the cost of a lantern and slides. After remarks by Messrs Dearness, Fletcher, Bethune and Bowman, it was resolved that "The consideration of the question of purchasing a Magic Lantern be referred to the library committee to obtain all the information possible about it during the year, and that they be authorized to purchase slides and to rent a lantern at such times as may seem advisable."

The next business of the meeting was the election of officers for the ensuing year, which resulted as on page 2.

HONORARY MEMBERS.—The following gentlemen were unanimously elected Honorary Members of the Society :—Dr. L. O. Howard, United States Entomologist, Washington, D. C.; Professor John B. Smith, Sc. D, Rutgers College, New Brunswick, N. J.; Professor F. M. Webster, Wooster. Ohio; Professor H. F. Wickham, Iowa City, Iowa.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present the following report :

The meetings of the section were held weekly as usual, and a gratifying amount of interest in the study of geological science was evinced.

The noteworthy features of the year's study were the following : (*a*) An examination of local geology, including discussions respecting the origin of the flowing sulphur springs; (*b*) an investigation of the extent of local peat beds; (*c*) visits to Kettle Point; (*d*) visits to Western Ontario oil fields ; (*e*) and a very interesting account of a visit to the Parry Sound district. Besides these visits Mr. Percival revisited the Strontium cave at Put-in Bay Island, Ohio. Mr. Goodburn also visited the Lake Superior copper region, and will report on it.

LOCAL GEOLOGY.

London is situated in a wide valley eroded by the river, whose two main branches unite at this point. It is probable that the course of the river has been changed here more than once, and that at one time the north branch flowed east by way of Carling's Creek and joined the east branch on the eastern limits of the city, and that the channel of the east branch is now several hundred feet south of its ancient location. The boulder clay is here deeply overlaid by clean water-washed sand, with quicksand in many places. The distance to bedrock is about 120 feet in the lower parts of the city. On the highlands surrounding it is much more. At Mt. Brydges, 20 miles west, it is 300 feet. Thus the depth of the drift and boulder clay is a feature of the locality. In the eastern part of the city pure water is obtained abundantly in the drift, but lower down than the boulder clay no water suitable for domestic use in quantity has been found until great depths are reached. On the other hand, at the Forks, and generally in the western portion of the city, sulphur springs are found in the upper rock strata. A sulphur spring, flowing 40 cubic feet per minute, struck about thirty years ago, continues to flow in undiminished volume. The water rises to a height of 24 feet above the surface, and formerly was utilized to turn a wheel and made to do useful work at street watering until the sulphuretted hydrogen created a nuisance on the streets and in the shops where iron goods were sold. Analysis of the water shows it to be highly mineralized, and it is reputed to be valuable as a remedy in cases of certain skin diseases, particularly eczema. Facilities for bathing have been provided, and are patronized by the general public. The quantity of sulph. hydrogen is not large, though from its offensive odour it would appear to be exceedingly abundant. The gas probably has its origin in the decomposition of the gypsum beds of the Onondaga group, and coming from higher levels to the eastward flows as before noted. The temperature of the water is 48°, and in summer seems icy cold. It is scarcely possible that it comes from any great depth, as if it did so its temperature would be considerably higher.

Dr. Woolverton, chairman of the Section, revisited Kettle Point and its vicinity during the summer. In addition to the rocks noticed last year he traced an outcrop of Corniferous limestones, distant about two miles from the present shore of Lake Huron and parallel to it. A species of large spirifer (*Spirifer increbescens*) was abundant. The specimens collected were much larger than *S. mucronatus*, abundant near Thedford. The rocks are lower than those of Thedford and Arkona. They form an old shore line, and between them and the lake are extensive sand dunes. Economically they furnish a coarse lime for rough building purposes, but contain too much iron for use in buildings of the better class. An old Indian trail crosses this lime bed. The Indians throughout Lambton County have a general tradition that a silver lead mine exists somewhere in the vicinity. Among other places No. 4 hill in Bosanquet, three miles from Arkona, is pointed as the location of the mine, but the Doctor was unable to find any trace of it. Another locality pointed out is a bluff on Black Creek, near Oil Springs, where it is said the Indians formerly made their own bullets. Like the Indian idea that a seam of coal exists under water at Kettle Point, the notion that a galena vein exists in Lambton is not generally believed.

STRONTIUM CAVES.

Mr. Percival paid a second visit to the Strontium sulphate cave at Put-in-Bay Island. Another cave of large size, named Dossard's, has been discovered on an adjoining lot. It contains some crystals of Strontium, and has stalactities and stalagmities. It is in the form of a crescent, and is said to be 700 feet in length. Like Perry's cave in the same vicinity, it is in limestone rock.

PEAT BEDS.

A number of the members of the section visited a peat bed, situated about 3 miles west of London at Redmond's farm. It lies in a low spot bordered by high hills on the east and north. Towards the south a barrier not more than a few feet in height isolates it from the River Thames. In the centre is a pond of clear spring water over 60 feet in depth. This spring is capable of furnishing one million gallons per day of excellent water, and as it is only about ¾ mile from Springbank it will probably in time become valuable. This water finds its way through gravel beds into the river. The surface of the pond is 109 feet above the river. Around the margin of the bed is a tangled growth of firs, willows or other shrubs. Farther in are cranberry and other low bushes, while thickly covering every available spot is a feathery moss called Sphagnum, with occasionally pitcher and other aquatic plants. This peat bed covers about 48 acres, and is quite deep over most of the surface. A depth of 60 feet has been measured during the winter season when the pond is frozen over. Members of our Section measured it where practicable, and found from 8 to 20 feet of good peat in its outer zone. Mr. Kirk and others have tested its quality as a fuel, and have found it to be of a high standard. Some of it is remarkably dense for peat, and when air-dried for a few days it requires considerable force to break it. The specific gravity of one sample was but little below 1, which is about four times as dense as peat usually is. It is easily kindled, burns with a bright flame, gives off great heat, and burns almost entirely away. Only an insignificant amount of ash remains. The ash is light and flaky, and is entirely free from slag or clinkers.

As Ontario possesses at a moderate estimate 1,000,000 acres of peat, the economic value of this hitherto neglected fuel is very apparent. It will soon be appreciated on this continent as it has been for so long in the Old World. Coal contains from 1 to 1½ per cent. of sulphur, and this forty to sixty pounds of sulphur per ton has a most damaging effect on the iron smelted by its agency. Peat contains no sulphur, and is to be used in our new iron furnaces at Orillia. For domestic use it is soon to be put on the market at Stratford and elsewhere. A company is now being formed to develop our local beds. Sphagnum is the best material for paper-making, and a cloth for making antiseptic bandages is being now made from it. For steam raising peat is an ideal fuel, filling the firebox with flame, while it is without the disadvantage of the sulphur which corrodes the firebox and tubes of the boiler. Being almost smokeless it would be most welcome as a domestic fuel, and for factory use. When destructively distilled peat yields besides various useful compounds obtained from coal, about 10,000 cubic feet of gas. Peat gas is more easily purified than gas made from coal, and it leaves no vile-smelling lime compounds to be got rid of as is the case with coal. About 100,000 cubic feet of water gas can be obtained from one ton of peat, and this gas without enriching can now be used for lighting through the discovery of the incandescent mantle. As a fuel gas it would be very cheap and of great heating power, as it is largely composed of hydrogen, whose heating capacity is more than four times that of an equal weight of coal gas. For heating it would be nearly as cheap as natural gas, and next in convenience and cleanliness to electricity, used for that purpose, and at a hundredth part of the cost of the latter.

Other peat beds are known to exist in the neighborhood. A majority of the members of the section paid visits to the peat beds among whom may be mentioned Dr. Woolverton, Mr. Percival, Mr. Sangster and Mr. Kirk.

OIL WELLS.

Dr. Woolverton reported on the developments in the Dutton oil district. During the year several wells, producing at first 25 bbl. a day, were struck. The production diminished in a short time to 1 to 2 bbl. The Standard Oil Company is actively developing in that district.

Mr. Kirk visited the Sarnia oil district where the Standard Co'y is also developing a new oil territory. A well which produced 40 bbl. a day was struck there during the month of July last. It continued to produce at that rate for about 3 weeks after which it gradually fell off to about 10 bbl. a day. The average production of the wells in the Sarnia district is about 1 barrel a day.

PARRY SOUND DISTRICT.

Dr. Woolverton spent several weeks in the Parry Sound district and made a most interesting report on its rock formations, characteristic minerals and its prospects as a mining region. 'The Huronian rocks,' he said, 'are much disturbed throughout the whole region, and dip in every direction, while intrusive rocks are very common. Most of the surface rocks were metamorphic, the capping being usually gneiss. The boulder-strewn surface is covered with a dense carpet of lichens. Among other samples collected here are marbles, pure quartz of various shades from white to quite dark, jasper conglomerates, mica, Bornite, Chalcopyrite and Copper pyrites. These garnets were obtained from Parry Harbor. The mica specimens, of excellent colour and of merchantable size, are found about seven miles from Parry Sound. A strongly mineralized zone extends from Parry Sound to the Muskoka lakes, a distance of about 20 miles south east, while far to the north the region is well mineralized. A number of companies with sufficient capital are actively pushing the development of copper prospects and properties have changed hands at high prices. Mention may be made of the development work being done by The McGown Mining Co., The Wilcox Co'y., The Le Fex Co'y., The Parry Sound Co'y., C. Copper Co'y. and The Bornite, the latter being a local concern. Not much nickel has yet been found. The Bornite is found in rich pockets. A sample lot of six carloads netted the owners about $5000. Copper pyrites is extensively found and is quite rich in copper.'

S. WOOLVERTON, Chairman.

REPORT OF THE MICROSCOPICAL SECTION.

The section was organized on Oct. 22, 1898, with the following officers:—J. A. Balkwill, Chairman; S. Silcox, Secretary, J. H. Bowman and W. H. Rennie, committee.

Eight meetings were held during the winter, beginning Nov. 12th and on each 2nd and 4th Saturday thereafter. At several of these the subject of Ecology was taken up, following notes obtained at Chicago University by W. T. McClement, M. A. of the

Armour Institute, Chicago. Many interesting sections of plants from various sources, microscopical plants and organic salts were presented for examination at the meetings.

Papers were read on the Agaricinae by J. H. Bowman; Starch by J. Dearness; microscopical examination of crystals by J. H. Bowman, and these papers were reviewed: "Staining Algae" by J Chamberlain, Chicago; "Histology of plants in relation to their environment" by W. T. McClement, Chicago.

J. A. BALKWILL, Chairman.
S. SILCOX, Secretary.

REPORT OF THE MONTREAL BRANCH.

The 216th* regular and 26th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held at 74 McTavish St. on 9th May, 1899.

The members present comprised Messrs. Henry H. Lyman (President), A. F. Winn (Vice-President), Dwight Brainerd, J. B. Williams, A. E. Norris, M. W. Davis, Rev. W. A. Fyles, G. A. Moore, G. Chagnon, and L. Gibb; visitor Rev. E. C. Trenholme.

The chair was taken by the President and the minutes of the previous meeting were read and confirmed and the minutes of the last annual meeting were also read.

The President then submitted the following report of the Council for the past year:

REPORT OF THE COUNCIL.

In presenting their twenty-sixth annual report the Council have much pleasure in referring to the fact that the season just closing has been the most memorable in the history of the Branch, owing to the highly successful celebration of the 25th anniversary of its formation, which was held on the 8th of November.

Special mention should also be made of the holding, in connection therewith, of the annual meeting of the parent society which gave our members an opportunity of meeting such pioneers in Canadian Entomology as Dr. Bethune and Dr. Saunders and of taking part, as members, in an annual meeting of the parent society.

Since our last annual meeting three new members have been added to our roll, one being transferred from the parent society. During the year eight meetings have been held, at one of which we had the pleasure of the attendance of Rev. Dr. Fyles and at another of Dr. Fletcher, and the following papers were read and addresses given :—

Annual address of the President, H. H. Lyman.

Notes on ovoposition of a clothes moth when in a dying condition, E. T. Chambers.

Life history of Xylina Bethunei, H. H. Lyman.

Notes on collecting in British Columbia, D. Brainerd.

On arranging Lepidoptera to illustrate family groups, J. B. Williams.

The early days of the Montreal Branch, sent by Mrs. A. L. Jack.

Notes on a few moths, H. H. Lyman.

The basket worm, Thyridopteryx Ephemeræformis, A. F. Winn.

Observations on the emergence of the imago of Papilio Brevicauda, A. F. Winn.

Notes on the Genus Grapta, H. H. Lyman.

Address on his ascent of Mt. Cheam, Dr. James Fletcher.

Address on the Medico-legal aspects of entomology, Dr. Wyatt Johnston.

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*Last year's annual meeting was supposed to be the the 215th, but it was found that in 1889 a mistake had been made in the count which has now been corrected.

On the protection of Lepidoptera from mites and other pests, A. E. Norris.

Notes on Danais Archippus, H. H. Lyman.

The President also attended a meeting of the Toronto Branch and read a paper before it. The annual course of half-hour lectures to young people at the Natural History Society again received the assistance of several of our members.

The average attendance at the meetings has been a fraction over 10, being the highest average in the history of the Branch.

The Treasurer's report shows that the finances of the Branch are in a satisfactory condition, and the Council would suggest that some provision be now made for the care of such books as the Branch possesses, that they may be readily available for the use of the members.

A number of our members took part in the annual field day of the Natural History Society at Rigaud, on 4th June, and another field excursion was made to St. Rose and St. Therese on the 1st July, in which four of our members participated.

Respectfully submitted on behalf of the Council.

HENRY H. LYMAN.
President.

The Treasurer then submitted his report, which showed an accumulated balance in hand of $45.26.

Upon the motion of Mr. M. W, Davis, seconded by Mr. A. E. Norris, the reports of the Council and Treasurer were received and adopted.

The President then read his annual address, making it his valedictory upon retiring from the presidency, reviewing the past history of the Branch, and giving many interesting details of the early years.

A vote of thanks to the President for his address was carried, and the Secretary was instructed to copy the address in full in the minutes.

The following officers were then elected for the ensuing year :

President, Albert F. Winn ; Vice-President, Dwight Brainerd ; Secretary-Treasurer, Lachlan Gibb ; Council, Henry H. Lyman, G. O. Dunlop, A. E. Norris,

The retiring President then vacated the chair, which was taken by the new President, who read an interesting paper on "Collecting at Electric Light."

After discussion and the examination of specimens brought by the members the meeting adjourned.

LACHLAN GIBB,
Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The third annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Education Department (Normal School) on Friday evening, the 7th April, 1899.

The following members were present: Messrs. Cherry, Stewart, Walker, Fenwick, Wilby, Austen, Kinghorn, Gibson (Secy.-Treas.), Carter and Tyers ; visitor: Mr. Wm. Watkins.

In the absence of the President and Vice-President, the Secretary was requested to act as Chairman.

The minutes of the previous regular meeting were read and approved.

The Secretary read the following report of the Council for the year ending 31st March, 1899 :

REPORT OF COUNCIL.

The Council of the Toronto Branch of the Entomological Society of Ontario take pleasure in presenting the third annual report of the proceedings of the Branch for the year ending 31st March, 1899.

They have much gratification in stating that, since the last annual meeting, four new names have been added to the roll of membership, viz, Messrs. E. M. Walker, G. M. Stewart, Allan Kinghorn and Donald Wilby, and the hope is expressed that all the members will endeavor to obtain other new additions in the near future.

During the past year twenty regular meetings have been held, the following papers being contributed from time to time:

"Relations existing between plants and insects," by Mr. S. R. Carter.

"Muskoka as a collecting ground," by Mr. A. Gibson.

"Notes on the collection and preservation of Botanical specimens," by Mr. S. R. Carter.

"The life history of Xylina Bethunei," by Mr. H. H. Lyman, of Montreal.

"The evolution of the insect," by Mr. E. M. Walker.

"What value is to be derived from a study of Entomology?" by Mr. A. Gibson.

"Head appendages of the Orthoptera," by Mr. G. M. Stewart.

During the collecting season three field days were held, viz., on the 24th May to Silver Creek, on the 11th June to High Park, and on the 18th July to High Park.

In December last, certain of the members being interested in plant life, the suggestion was made that a Botanical Section be formed, and the following motion was made by Mr. Carter, seconded by Mr. Walker, and duly carried: "That in view of certain members of the Society being interested in the study of Botany, a section be formed with the object of encouraging this branch of Natural Science, with the hope of securing new additions to the roll of membership, and also in view of the close relationship existing between the entomologist and the botanist, particularly from the entomological standpoint."

The report of the Librarian-Curator shows that the library and collection of insects is steadily increasing. Quite a large number of Government publications and other valuable books have been added to the library during the year.

The Treasurer's report shows a satisfactory balance on hand of $9.43.

All of which is respectfully submitted.

R. J. CREW,
President

The report of the Treasurer was presented as also that of the Librarian-Curator, submitted by Mr. Gibson. On motion of Mr. Austen, seconded by Mr. Cherry, the reports of the Council, Treasurer and Librarian-Curator were adopted as read.

The election of officers for the ensuing year resulted as follows: President, Mr. Arthur Gibson; Vice-President, Mr. E. M. Walker; Sec'y-Treas., Mr. G. M. Stewart; Librarian, Mr. H. C. Austen; Members of Council, Messrs. R. J. Crew and S. R. Carter.

In the absence of the President the Secretary then read Mr. Crew's address, which was listened to with much interest and which contained many valuable suggestions. He mentioned that it was gratifying to know that the branch had enrolled four new members during the year, which strengthened it a good deal and hoped the members would encourage others to join and take an interest in the work. Among other things Mr. Crew suggested that during the following winter certain of the meetings be set aside for certain subjects, all the members bringing as much information as they can about these subjects to the meeting in order that all may take part in the discussion and get the full benefit of the remarks. In this way he thought much interesting work could be accomplished. And if certain evenings were also set aside for dissecting and studying the anatomy of certain insects much useful information would thus be available. He also touched upon the newly formed Botanical Section, which as yet has not taken much shape, but the hope was expressed that other botanists might be induced to become members and thereby strengthen the branch. Mr. Crew, in conclusion, thanked the members for the honor they conferred upon him in electing him as their President for the year just closed.

The meeting then adjourned.

Arthur Gibson,
Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec Branch of the Entomological Society of Ontario was held on the 15th April, 1899, fourteen members being present; the President, Rev. Dr. Fyles, occupying the chair.

PRESIDENT'S REPORT.

The Quebec Branch of the Entomological Society has commenced the third year of its existence. It was formed on the 24th March, 1897, and the time since has been marked by steady growth and increased usefulness.

The annual meeting of 1898 was held at the house of the Secretary-Treasurer of the Association and was a happy and successful gathering. During the year following three very pleasant meetings were held at the homes of members: Mr. Thos. Poston, Levis; Mr. J. E. Treffry, Quebec; Mr. James Geggie, Beauport, and seven were held at Morrin College.

Field days were also pleasantly spent at Bergerville (June 5th), the Island (June 18th and August 4th), and at Levis Forts (July 21st). On these occasions many interesting captures of insects were made and much information concerning them imparted.

In the course of the year papers were read or addresses given on the following subjects:

The destruction of the forests, the Apidae, the Coleoptera, Garden Pests, Silk-worm moths, Arsenical spraying and Honey Bees, the Book of Nature, Spiders, Crickets, Wasps.

At one of the meetings beautifully illustrated Entomological works were exhibited by Miss Bowen, and a most interesting history of the Entomological Society of Ontario, written by Rev. Dr. Bethune, one of the founders of that society, was read by Miss Palmer, B.A.

The captures made during the year included the rarities: *Catocala bianca, Platarctia parthenos, Spilosoma congrua, Lophopteryx elegans*, besides several undescribed species.

Of destructive pests, the only noteworthy appearances in this Province in 1898 were those of the Tent Caterpillars, *Clisiocampa Americana* and *Clisiocampa disstria*. These were so numerous last summer in parts of the counties of Drummond and Shefford that they stripped the second growth trees bare. Should the coming season prove favorable to their increase they will probably do much harm. A forked stick thrust into the webs in the early morning or late in the evening when the caterpillars are "at home", and twisted round, will entangle the creatures in their habitations, which can then be drawn from the tree and trodden under foot.

On the 8th of November, the Montreal Branch celebrated its 25th anniversary, in the Natural History Society's Rooms, University Street. On this occasion eminent entomologists from London, Toronto, Ottawa and and other places were present. The Quebec Association was represented by its president, who was specially deputed by its members to convey their congratulations to their Montreal *confreres*.

It is gratifying to see the spread of interest in Entomological pursuits. The past year has been marked by the formation of "The North West Entomological Society." It numbers among its members the Right Reverend the Bishop of Calgary and Saskatchewan; John A. Simpson, M.L.A.; A. G Wolly Dod, Esq, Secretary of the Fish Creek Agricultural Society; Dr. H. George, Vice-President of the Innisfail Agricultural Society; Wm. Posthill, Esq., J.P., Vice-President of the Red Deer Agricultural Society; John Y. Young, Esq., editor of the "Calgary Herald". The membership of this society exceeds forty already.

It is to be hoped that our own association will continue to flourish and will spread information concerning our insect friends and insect foes, and the right method of dealing with both. One of our leading botanists, while seeking to advance agricultural interests. truly said: "A good knowledge of Entomology is good for the farmer—*There is money in it.*"

REPORT OF COUNCIL.

Your Council has pride in producing this report for the approval of the branch as we have nothing but pleasure to note as to its working.

The branch now includes forty-two members; 28 adults and 14 juniors. The Treasurer's report gives a most satisfactory showing.

Several excursions were made, and the capture of many specimens—some of them rare—has rewarded the efforts of the members. As was remarked in a former report these excursions tend to bring about a good feeling of comradeship and are beneficial in every way. The younger members of our branch have been extremely keen in hunting for and acquiring specimens and their efforts have been highly successful.

The largely increasing membership affords much reason for congratulation.

Our thanks are due to the authorities of Morrin College for their kindness in placing a room at the disposal of the branch for its meetings.

JOSEPH EVELEIGH TREFFRY,
on behalf of the Council.

The following officers were elected:

President, Rev. Thomas W. Fyles, D. C. L.; *Vice-President*, Miss Macdonald; *Council*, Hon. Richard Turner, Mr. J. Eveleigh Treffry, Prof. H. Walters, Mrs. R. Turner, Miss Bickell, Miss B. Winfield; *Secretary-Treasurer*, Lt. Col. Crawford Lindsay; *Curator*, Prof. H. Walters.

Since the annual meeting in April the Branch has held four regular meetings and four field days.

The Branch now numbers thirty-two adults and fifteen junior members.

CRAWFORD LINDSAY,
Secretary-Treasurer.

Quebec, October 7th, 1899.

REPORT FROM THE ENTOMOLOGICAL SOCIETY FO ONTARIO TO THE ROYAL SOCIETY OF CANADA.

BY REV. THOMAS W. FYLES, D.C.L., F.L.S., DELEGATE.

The Entomological Society of Ontario held its 35th annual meeting in Montreal on the 8th and 9th days of November last. The Society is gaining ground—is lengthening its cords and strengthening its stakes, or, to use another figure, is rooting itself more firmly in public estimation, while its ramifications are vigorous and fruitful.

Originated in 1863, through the efforts of a very few earnest men, who were impressed with a sense of the practical value of Entomological pursuits, the Society has steadily progressed till it has attained a degree of importance that insures for it the respect of scientific men "all the wide world over." Its publications are now circulated in 22 countries, in the four quarters of the world. On this continent, not only are they distributed throughout our own dominion, they are sent also to no less than 40 of the states and territories of the great Republic to the south of us.

At 429 Wellington Street, London, Ont., the Society has its headquarters—a large, convenient and well appointed room, with a valuable library of 1,600 volumes, and cabinets containing many thousands of choice specimens, contributed by its members or obtained by purchase or donation. Among its treasures are special collections, such as the Pettit collection of Coleoptera, the Loomis collection of Japanese butterflies, the Moffat collection of Canadian Lepidoptera, acquisitions gained through years of research by skilful, scientific men.

The Society's librarian and curator is Mr. J. Alston Moffat, a man devoted to his work, well acquainted with the objects under his care, and most kind and obliging to those who seek information from him. The room is open at all convenient hours; and an examination of its contents will well repay the naturalist who will take the time to visit it.

The various sections of the Society are working zealously. The Botanical section reports the discovery of three plants new to the district of London. It also draws attention to a species of wild lettuce (*Lactuca scævola*) that is rapidly spreading, and becoming troublesome to the agriculturists of Middlesex County, and to a species of dodder (*Cuscuta epithymum*) that flourishes upon clover. The Microscopical section has held 9 meetings in the course of the year. Papers on "Shine Moulds," Bacteria, Radiolaria, Diatoms, and Marine Algae, were read before it. The Geological section met weekly throughout the year. Its report describes the bituminous shales of Kettle Point, the "Crystal Cave" at Put-in-Bay, and the strontium found in it. The Alvinston shales; the dolomite rocks at Galt, and the new oil-field in Sarnia Township.

Notes on the "Insects of the Year" have been sent in by the Society's divisional directors:—Messrs. W. Hague Harrington, Ottawa; J. D. Evans, Trenton; Arthur Gibson, Toronto; A. H. Kilman, Ridgway; R. W. Rennie, London. These notes appear in the Society's annual report.

Flourishing branches of the Society exist in Toronto, Montreal, and Quebec. That of Montreal is particularly deserving of notice, forasmuch as it has recently celebrated the 25th anniversary of its formation. To do honor to the occasion the parent society held its annual meeting in Montreal, and the Natural History Society and the Microscopical Society of that city gave their aid and support. The proceedings were of a most interesting and enjoyable character.

The Society's monthly organ, "The Canadian Entomologist,' completed its 30th volume in December last. In this volume articles from 53 contributors may be found. Some of the authors wrote from such distant places as Cape Town, Africa; Hildesheim, Germany; Mesilla, New Mexico; Massett, Queen Charlotte Islands. The volume contains, amongst other important matter, descriptions of 35 new genera, and 190 new species of insects, and it is illustrated with six plates, one of which is beautifully coloured. Among the more important articles are:—

A generic revision of the Lachneidæ, by Harrison G. Dyar, Washington, D.C.

On the history and habits of the "Wood Engraver" Ambrosia Beetle, by A. D. Hopkins, Entomologist, West Virginia Agricultural Station.

The Coleoptera of Canada, by H. F. Wickham, Iowa City.

"New and little known bees," by T. D. A. Cockerell, N. M. Experiment Station.

"Some Indiana Acridiidæ," by W. S. Blatchley, Indianapolis, Ind.

"New species of Chionaspis, and notes on previously known species," by R. A. Cooley, B. S., Amherst, Mass.

"New species of North American Myrmelionidæ," by Rolla P. Currie, Washington, D. C.

"Metallic species of Basilodes and new species of allied genera," by R. Ottolengui, New York.

"Descriptions of new genera and species of the Geometrina of North America," by Geo. D. Hulst, Brooklyn, New York.

"Notes on some Ontario Acridiidæ," by E. M. Walker, Toronto.

"Classification of the Horntails and Saw-flies, or the sub-order Phytophaga," by William H. Ashmead, assistant curator Dep. of Insects, U. S. National Museum.

"Additions to my Synopsis of the Tachinidæ," by D. W. Coquillett, Washington, D. C.

The twenty-ninth annual report of the Society "(published by the Ontario Department of Agriculture, Toronto), printed by order of the Legislative Assembly of Ontario," has just been issued. It is embellished with portraits of William Hague Harrington, F. R. S. C., president of the Entomological Society of Ontario, 1893–5, and John Dearness, I. P. S, president of the Entomological Society of Ontario, 1895–7, and also with 67 figures of insects. It contains a full account of the annual meeting, reports from the officers and the various divisions and branches of the Society, the President's address, articles entitled:

"Some economic features of International Entomology," by F. M. Webster.

"The farmer's garden and its insect foes," by the Rev. Thomas W. Fyles.

"Entomology in schools," by Wm. Lochhead, Ont. Agr. College, Guelph.

"Injurious insects in 1898," by Dr. James Fletcher, Ottawa.

And a number of short papers of great value.

In the president's address attention is drawn to some remarkable experiments, of interest to biologists, made by Mr. Henry E. Crampton, jr., of the Department of Zoology of Columbia University. Mr. Crampton succeeded, in a number of instances, in grafting one insect in the pupal stage upon another in the same condition. For instance, he cut off the head portion of one chrysalis and several segments of the abdomen from another, and then joined the main portions of the two by means of a ring of paraffin. Coalescence was completed and, after a time, a living, eight-winged monstrosity was produced.

The disposition evinced by some, in the present day, to tamper unnecessarily with the nomenclature and classification of insects, now accepted, is also spoken of. Our systems are not perfect, but the day for a thorough revision of them has not yet come, and will not till the life histories of the various species, and the literature respecting them are better known. The late Dr. Lintner did excellent work in tracing such histories, and in heading his remarks with names and synonyms and references to authors. His work in these respects as in others is a model for entomologists.

In connection with this subject, the paper by Mr. Dwight Brainerd, in this same report, on "The preparation of specimens for the exhibition of life histories in the cabinet" will be found valuable. The plate that accompanies it shows groups of insects in all stages. There are the eggs, the larva, the pupa, the perfect insects (both types and varieties), the wings denuded of scales to show the venation, and the parasites that assail the species. From an educational point of view, a complete collection on Mr. Brainerd's plan would indeed be accounted a treasure. The article is the more valuable because the author describes his methods of preparing specimens for the cabinet.

Another important paper in the report is Prof. Wm. Lochhead's "Entomology in the Schools", showing *Why? How? and When?* the subject should be brought before the rising generation.

It is hoped that sufficient has been said to show that the society's publications are of value. Prepared chiefly for the agricultural community, its reports deal largely with troublesome insects and the methods of destroying them; but the beautiful and beneficial species are not overlooked in them; and even, as regards the less attractive kinds, so much that is wonderful in their structure and life histories is made known to us—so clearly is it shown that through and beyond the trouble they may give to man, destructive insects have important parts to play in the economy of nature, that our admiration is excited, and we feel the truth so quaintly expressed by the Rev. George Herbert:

"Nothing we see but means our good,
As our delight, or as our treasure;
The whole is either our cupboard of food
Or cabinet of pleasure.

THE NATIVE HOME OF THE SAN JOSE SCALE.

By F. M. WEBSTER, WOOSTER, O.

In the July, 1898, number of the Canadian Entomologist, I published a short discussion on this subject, giving the results of some, then recent, examinations of nursery stock, coming directly from Japan. I there also referred to a short note by Prof. T.D.A. Cockerell, in Entomological News, Vol 9, pages 95 and 96, to the effect that Mr. Alexander Craw, Quarantine officer at San Francisco, California, had two or three times found this insect on trees from Japan, and notably on a plum tree that arrived Jan. 25th, 1898. After this note of mine had been published, Mr. F. A. Sirine, one of the entomologists of the New York Experiment Station, located at Jamaica, N.Y., wrote me that there was some pretty good evidence in his possession indicating that the San José Scale had been established on Long Island a much greater length of time then was supposed; that its occurrence there possibly antedated its appearance in New Jersey. When I prepared my paper for the 1898 meeting of the Entomological Society of Ontario, entitled "Some International Problems in Applied Entomology," and, on again going over my notes, it appeared to me that, with the amount of material in my possession and its appearance, I had sufficient evidence not only to verify all that had been stated or written, but that I had almost the conclusive evidence wanted to prove that Japan was the original home of the scale, and that it was, as with the Gypsy moth, being kept reduced and in subjection by its natural enemies. I did not, at the time, have in my possession a paper published in the June, 1898, Massachusetts Crop Report by Mr. A. H. Kirkland, in which he makes the following statements:

"While it is generally conceded that 1887 marks the date of the first importation of the scale to the east, a case has recently come to the writer's attention that would indicate the possibility of the occurrence of the San José Scale in a Long Island nursery at a date somewhat earlier than that of the New Jersey infestation, and possibly as a result of the direct importation of trees from Japan. The facts are these:

In the vicinity of Boston there is an educational institution where particular attention is given to the study of trees and shrubs. On the grounds of this institution, there is a colony of the San Jose Scale which is confined in great measure to a plot of perhaps thirty Japanese quince bushes. These bushes, according to the testimony of those in charge of the grounds, "have been infested for many years." Careful records of all trees planted are kept by the authorities of the institution, and in this case the records show that the bushes in question were purchased from three sources: the firm of James Veitch & Sons, London, England, in 1881; Louis Spath, Rixdorf, Berlin, Germany, in 1888; and the Parsons & Sons Company, Flushing, Long Island, in 1884. The greater part of the bushes were obtained from the latter source, and these are infested to the greatest extent, although the scale occurs on all of them. The infestation of this nursery for many years past is a matter of common knowledge among entomologists and nurserymen; also the fact that this nursery has paid especial attention to the importation and distribution of Japanese stock. Unfortunately, all these Japanese quinces were grown for one season in a very compact plot and their infestation is so general that it is impossible to decide which were the ones originally infested. From an inspection of the grounds, it is evident that these bushes are the centre of infestation in this colony; and, unless it is shown that the English and German nurseries are infested, of which there is no evidence at present, the natural inference is that the Long Island nursery is the source from which the infested stock was obtained, thus antedating the New Jersey occurrence by about three years. Again, the conclusion that the Long Island stock was the source of the scale at this particular locality may be placed the length of time elapsing since its purchase,—some fourteen years. The time required for the killing of trees by the scale is placed by Messrs. Howard and Marlatt at from two to three years. In the south, where the active season of the insect is longer than it is here, and the warmer climate more favorable to its multiplication, undoubtedly this may be the case. It is also probable that a longer time is required for the destruction of trees from this cause in this region; for we have records of an apple orchard at Scituate, Mass., planted in 1892 with infested trees two or three years old, of which about 90 per cent., although very badly affected, were alive in 1897, at which time remedial measures were applied. Since a Japanese quince with vigorous roots will throw out an abundance of new shoots year after year as the old wood dies off, the continued infestation since 1884 of the bushes previously mentioned does not seem beyond the limits of possibility."

Quite recently, some exceptions have been taken to the statement that I made in my paper last year, presented to the Entomological Society of Ontario, in which I used these words, "I have been able to prove almost conclusively that Japan is the original home of the San Jose Scale." The arguments against this are that Mr. Koebele and some of the Japanese entomologists searched for San Jose Scale in Japan, but did not find it. If this means anything at all, it might mean that the scale was present but kept thoroughly in subjection by its natural enemies, and perhaps some other resistent elements of which we are, as yet, unacquainted. Another argument is that the scale may have been introduced into Japan, from California, and was now, for the first time, being received back again from that country. At present, we have no record of any very old introductions of nursery stock from California into Japan, and if there were, it would be difficult to prove, or even to show evidence that these were infested with the San Jose Scale. The nursery stock that I have myself examined came direct from Japan, and gave every possible indication of its having been quite numerous where the stock was grown; and the occurrence differed very materially in appearance from the ordinary occurrence upon nursery stock, as witnessed in this country. Up to the present time, I see no reason whatever for modifying the statements that I have made. I do not claim that there is, as yet, conclusive proof that the scale came to us originally from Japan, but that the evidence points almost conclusively in that direction, I feel as confident as I did when I prepared my previous statements. Of course, there is nothing left to do but trust to time and future investigations to solve the problem. Entomologists in Japan can certainly throw a great deal of light upon this problem, and if the question can be settled, finally, either in the affirmative or negative, I shall be entirely satisfied. I do not care a straw whether the San Jose Scale is, originally, a native of Japan or not, but I do care a great deal as an entomologist, to know just the fact in the case, not as a matter of self-interest but as a scientific fact.

SOME NOTES ON THE LARVAL HABITS OF THE GRAY HAIR-STREAK BUTTERFLY.

(*Uranotes melinus*, Hubn.)

By F. M. Webster, Wooster, Ohio.

The larvæ of the Gray Hair-streak have long been known to injure beans by eating their way into the pods and devouring the young growing beans therein. In Insect Life, Vol. VII, p. 354, the statement is made that these larvæ, though long known as injurious to the hop, had also been known to injure young beans in New Jersey, District of of Columbia and California.

On July 3, 1899, a correspondent of mine, Mr. Henry Hurd, Carthagenia, Ohio, sent me a pea pod in which he had found a worm of some sort, eating the peas. The pod reached me in good condition, and clearly indicated the seriousness of the attack, but the depredator had eaten out of the box and through the wrapper, and doubtless was lost in the mail sack. On July 10, Mr. Hurd sent a second larva, which reached me alive, but it never developed. Mr. Hurd stated the first one sent, ate three grown peas and gnawed into a second pod within the space of a few minutes.

On July 7, the Station janitor brought me some larvæ which he stated were eating into the pods of his garden beans. These larvæ were placed on a hill of beans and covered with a breeding cage. On August 8, a single adult *Uranotes (Thecla) melinus*, Hübn, was found dead in the cage.

On August 14, a correspondent, Mr. Fred. Ruth, Clifford, Ohio, sent two larvæ which he had found in the silk in the tips of the ears of corn in the field. As he had found adults of *Diabrotica longicornis* in the same situation, Mr. Ruth supposed that they were the adult insect from these larvæ. As soon as they were received they were at once recognized and placed upon young bean pods, upon which they at once began to feed. On August 22, both pupated, and from one of these pupæ an adult issued on September 1, while the other has up to this date, October 4, remained undeveloped.*

While we lost the first larva sent by Mr. Hurd, the second was recognized, and if it was not of the species under consideration, it certainly belonged to a species closely allied to this. Thus we have the pea as a probably new food plant, and the silk of corn on the ear as an undoubted additional new food plant for the species, and certainly rather a unique locality for the larvæ to be found in.

According to the article referred to in the beginning, which by the way is illustrated, the habitat of the species is given as Canada (rarely); and south to Indian River, Florida, and quite to the Mexican border, Mexico, Central America, Venezuela and the Antilles. The present is the first year that my attention has ever been called to the work of the larvæ.

SAN JOSE SCALE.

The meeting was called to order at 2.30 o'clock, the Vice-President, Rev. Dr. Fyles, occupying the chair. After a number of papers (which are given in subsequent pages of this report) had been read and discussed, the consideration of the San Jose Scale insect was again taken up. The Secretary reported that the Special Committee had been unable to arrange any time for a meeting. Mr. Dearness said that as the whole of the previous afternoon had been spent in a conference upon this insect, it would be a pity if no action were taken by the Society; he accordingly moved that the meeting be considered as a committee of the whole, which was adopted.

At the request of the members present Mr. Dearness read a synopsis of the report of the Commissioners appointed by the Hon. the Minister of Agriculture to investigate the San Jose Scale last summer, and explained various points in connection with it.

Dr. **Fletcher** said that one of the great difficulties in the way of carrying out the recommendations of the Commissioners was the liability of the orchard owners to evade the law as far as possible, and to neglect the means recommended for checking the pest. The feature of the report which would probably be most objected to was the boarding of the men sent by the Government to perform the work, but this might be overcome by sending them to the nearest hotel for the short time that they would be in the neighbourhood. He thought that the Minister of Agriculture had acted very wisely throughout this matter, and that great care had been exercised in the selection of inspectors; if any were found inefficient their services were at once dispensed with.

After some further discussion the following resolution, moved by Dr. **Fletcher** and seconded by Dr. **Bethune**, was unanimously adopted:

"This Society has watched with keen interest and wishes to express its hearty approval of the measures adopted by the Hon. the Minister of Agriculture and Arts for Ontario for the suppression of the San Jose Scale, and the wise and judicious manner in which he has endeavoured to carry them out."

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* From this pupa the butterfly emerged on January 4th, 1900, thus shewing that of two larvæ, probably from the same brood and same mother, one may develop to the adult in September, and the other go over until the following spring.—F.M.W.

Several other papers were read and discussed, including the reports of the Directors on the noteworthy insects of the year in their respective divisions.

Dr. Fletcher exhibited some rare or otherwise interesting specimens, several of which he presented to the Society.

Hemileuca Maia var *Lucina*. This is the form of the species which occurs in Manitoba, the specimens presented had been taken by Mr. Norman Criddle, at Aweme, in Manitoba. In July, 1898, Dr. Fletcher had taken two nearly full grown larvae feeding on aspen at Bird's Hill a few miles from Winnipeg, and had bred the moths the same autumn. Variety *Lucina* differs from the species in the much greater area of white on the wings.

Colias Emilia—A fine pair presented which had been taken by Mr. C. de B. Green at Osoyoos. The eggs of this species are laid on *Astragalus frigidus*. It is a larger species than *Colias Christina*, some forms of which it resembles, particularly in the female sex. The eggs of *C Christina* Dr. Fletcher had seen deposited by the females on *Salix desertorum* at Olds, N.W.T.

Colias Edwardsii exhibited, which had been collected and seen in some numbers at Arcola, Glen Adelaide, Clare, Alameda, Carnduff and Gainsboro, in the south eastern part of the N.W.T. Females were seen ovipositing and eggs were collected on the Prairie Bean, *Thermopsis rhombifolia*. This species resembles closely *C. Alexandra*, but is smaller and has the margins partly fringed with pink.

Pamphila Manitoba, var *Assiniboia*, specimens of both sexes presented which had been taken at Regina in 1886.

Chrysophanus Helloides, var *Florus* (female) presented, taken at Vernon, B.C.

Argynnis Chariclea presented, taken at Mount Cheam, B.C.

Coenonympha inornata, presented, taken in large numbers in the N.W.T. this year.

Vanessa Californica, presented, one of the first specimens taken in Canada, caught in Victoria, B.C., 1885.

Carterocephalus Mandan, presented, a large form taken at Laggan in the Rocky Mountains which has been written about in the Canadian Entomologist by Mr. T. E. Bean in 1893 as *C. Palæmon*.

Lyda multisignata, a new pest of the raspberry. The specimens presented were bred from larvae, which had been sent from St. John, N.B., where they had been injurious for three years.

Crioceris asparagi and *C. 12-punctata*, the two asparagus beetles; first recorded as injuring asparagus in Canada this year. Both forms were abundant at Queenstown and other places in the Niagara peninsula.

Gonioctena pallida, specimens were presented. This beetle has been very abundant in many parts of the Northwest and Manitoba for three seasons. Aspen poplars have been entirely defoliated over large areas. They were less numerous last summer.

The following were exhibited :—

Lepisesia ulalume, a very rare species representing on the Pacific coast the eastern *L. flavofasciata*. The specimens were taken at New Westminster by Mr. Dashwood-Jones. The flight of *L. flavofasciata* was described and its close resemblance to a bumble bee when flying referred to.

Thecla strigosa bred from larvae found attacking green plums by Mr. W. M. Orr. at Fruitland, Ont.

Thecla Iroides, bred from larvae eating green apples at B.C., found by Mr. E. A. Carew-Gibson. The habit of boring into their food had also been noticed with the young larvae of *Thecla Niphon* which feeds on the young shoots of white pine.

Erebia Epipsodea. This species had been bred again this year from eggs received from Mr. N. B. Sanson, of Banff, Alta. There were only three moults as had been previously recorded by Mr. Lyman, but the mode of pupation was slightly different from that described by Messrs. Lyman and W. H. Edwards, the chrysalis being surrounded by several spans of silk in the same way as had been observed by the speaker in the case of *E. Discoidalis*. *E. Epipsodea* is an abundant species on the prairie from the western borders of Manitoba through the Rocky Mountains to the interior plateau of British Columbia. It was seen in hundreds on the prairies in the early part of last July.

Heliothis armiger. A specimen bred from a green larva found feeding upon geraniums in a greenhouse, late in the autumn of 1898, the moth of which had emerged in the summer of 1899.

Chinobas Macounii, eggs were shown which were laid by a female among the thorns on the dead twigs of a wild rose, at Nepigon. The bush was standing in full sunlight on a sandy bank and no plant of Carex or grass could be found within 10 feet. The female was seen to lay three eggs all on the dead twigs. These hatched in the ordinary time of 15 days.

Chrysophanus Thoe. Full grown living larvæ were shown, reared from eggs laid in confinement late in August. Of about 40 eggs half had hatched, but in nature it was thought by the speaker that as a rule the eggs did not hatch until the following spring. He had discovered that the females laid their eggs not on the seed pods of the dock, as had been previously thought, but low down on the root leaves and at the base of the stem, where they would be covered up with snow during the winter. Many eggs were found on plants growing in the water, and within an inch of the surface. The larvæ during the three moults, as well as the beautiful green and pink pupæ, were shown, also brown pupæ and a dipterous parasite (*Exorista confinis*). Larvæ and eggs had been found on *Rumex orbiculatus*, but larvæ fed readily on all docks offered except *Rumex obtusifolius*.

A beautiful collection of inflated larvæ, prepared by Mr. C. H. Young, of Ottawa, was exhibited, and, the value of this method of preserving a permanent record of larvæ for study was urged. Mr. Arthur Gibson, Assistant in the Division of Entomology, had also prepared some nice specimens, which were exhibited.

Lycæna Anna—A fine series of this rare species was exhibited with the larvæ and pupæ. Almost full grown larvæ had been found on the 8th of August last at a height of 7,000 feet on Mount Che-am, B. C. The larvæ are green, and feed on the leaves of lupins. The interesting discovery was made that the larvæ when full grown crawl down the stem and burrow down to pupate, from an inch to two inches beneath the surface of the ground, as a rule following the stem and remaining attached to it. Five females and three males were exhibited. These showed considerable difference in the markings of the lower side.

Benacus griseus—A specimen of this large water-bug, taken at Toronto, was shown, and the difference between this species and *Belostoma Americana* pointed out. The members were asked to examine all large water-bugs seen beneath electric lights, so that the range of the two species might be ascertained. Although sought for carefully at Ottawa, *Benacus* had never been detected there. In *Benacus* there is no deep groove down the middle of the cushion-like area on the front raptorial claws.

The Pea Aphis, *Nectarophora destructor* Jnsn. (n. sp) Specimens of the Destructive Pea Aphis, together with three parasites, were shown, and a statement made as to the injuries inflicted by this pest during the past summer. Colonies had appeared in various places from the Maritime Provinces to the western portions of Ontario.

On motion of Mr. W. E. SAUNDERS, seconded by Mr. BALKWILL, it was resolved that the thanks of the Society are due and are hereby offered to Dr. Fletcher for his kindness this year, and on many previous occasions, in presenting a number of valuable insects to the Society's collection.

The meeting adjourned at 4.30 p.m. in order to enable the members from a distance to catch their respective trains. It was the unanimous opinion of all present that this was the most useful, interesting, and also entertaining, meeting that the Society has ever held.

NOTES ON SOME INSECTS OF CONIFEROUS SHADE TREES.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

Chermes Abietis (Spruce Gall Louse). Many complaints were made in May about an insect which was attacking spruce trees. The terminal, young shoots were first attacked, then the immature leaves of the buds became enlarged at their base, and the tissues were gradually killed, so that the twigs curled up and died. Conspicuous woolly secretions were observed on the leaves of the spruce about the first week in May. These secretions enveloped masses of yellowish eggs (200 to 300 in number). About a week later the eggs hatched, and the young lice moved to the bases of the young leaves of the shoots, when enlargements began to form. A fine spruce hedge at the Agricultural College was infested so badly that it was feared that the fine trees would be permanently disfigured, and even destroyed. An examination of the new leaves revealed a louse at the base of nearly every new leaf, and the deformation of the twig were becoming quite evident. A later examination showed the presence of several fat syrphus larvæ, which had taken up their quarters at the bases of the leaves, and were feeding quite greedily on the lice. Many other buds were examined from different parts of the hedge, and in every case syrphus larvæ were found. To spray this tall hedge with whale oil soap and tobacco solution appeared a gigantic task, and to clip off the infested twigs was not to be thought of, as such an operation would be a life's task. Just at this juncture, when there seemed no other expedient but to leave the control of the lice to the syrphids, Dr. Howard, of Washington, who had been consulted in the matter, wrote as follows:

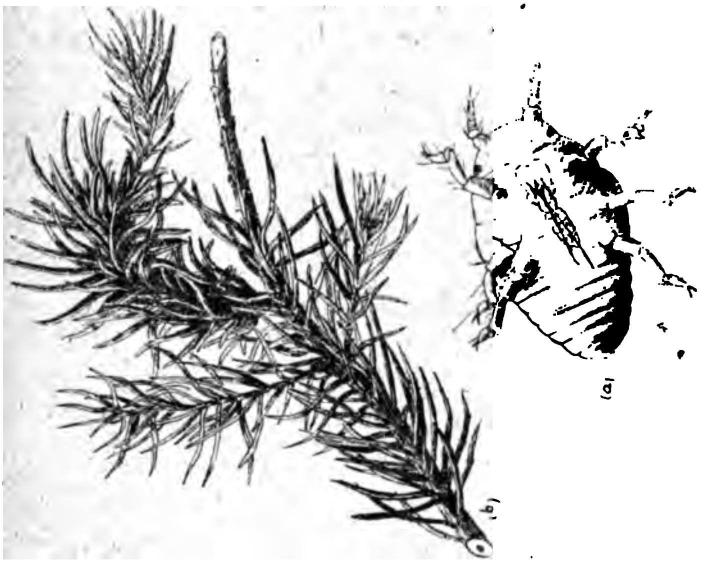

Fig. 8. Spruce Gall Louse. (a) Summer form of nymph. (b) A sprig of White Spruce, with one twig affected by galls produced by the young lice.

"Your best hope of relief seems to be in the probable ultimate appearance of some parasitic or predaceous enemy; and, when the gall louse is as abundant as you describe, I think relief in this direction will shortly be forthcoming."

Accordingly the lice were left to the tender mercies of the syrphids.

Observations during the remainder of the season were made rather intermittently on account of absence from College for several weeks; but, on August 19th, another examination of the galls and twigs was made. Woolly secretions were again observed which contained masses of eggs (30 to 40 in number). A few adult winged forms and many young lice were seen but in numbers not to be compared with those seen in May. Many syrphus larvæ were again found. On August 31st some of the infested twigs were again examined, but there were very few lice, no eggs and no adults, while the syrphids were *quite numerous*, and occupied tunnels in the leaf bases between the galls.

That Nature has done her work well, it is sufficient to state that the hedge never looked better than at present. Later shoots have appeared, and a stranger could scarcely tell that an insidious pest had started to work there in the spring.

Professors Fernald and Cooley, of Amherst, issued a bulletin on *Chermes abietis* during the winter. As the observations of the life-history of the Spruce Gall Louse at Guelph correspond very closely with those of Fernald and Cooley, a synopsis of the life-history is here given:

Summer Brood:

1.—In early spring—white woolly mass containing about 300 eggs, on new shoots.

2.—Eggs hatch in about one week, and nymphs settle in bases of young shoots.

3.—Three moults; antennae of 3 segments.

4.—About Aug. 10, winged adults—females—appear, antennae of 5 segments.

5.—Two days later eggs (40) are laid covered with a woolly secretion near tip of leaf.

6.—Eggs hatch in two weeks.

Winter Brood:

7.—Nymphs, antennae of 3 segments, spread over limbs near by, some attaching themselves to leaves, some at axils.

8.—Pass winter at base of buds, nearly all killed.

9.—About April 20, moulting begins, and nymphs grow very rapidly, secreting a copious woolly coating.

10.—Eggs are laid about May 1-10, and females soon die.

References:

1844. Ratzeburg—Forest Insects—p. 200.
1869. Packard—Guide to the Study of Insects—p. 522.
1876. Thomas—Transactions Illinois Hort. Soc.—p. 198.
1881. Ormerod—Manual of Injurious Insects—p.p. 240-244.
1888. Comstock—Introduction to Entomology—p. 160.
1890. Packard—Forest Insects—p. 853.
Buckton—British Aphides, vol. IV.—p. 31.
1896. Cholodkowski—Zoolog. anzeig, Jan. 1896—p. 37.
1898. Brodie—Bureau of Forestry, Ont. Dep. Ag.—The Spruce Gall-Louse.
1898. Fernald and Cooley—The Spruce Gall-Louse.

Lygæonematus (Nematus) Erichsonii (Larch Saw Fly.) On June 1st many adult females were observed ovipositing on the underside of the stems of the terminal shoots of the larch or tamarack.

During oviposition the female hangs head downwards, and the eggs are laid in incisions on the under side of the axis of the terminal shoots. (Fig. 9, *c*.).

The slits in which the eggs were placed very closely were made in two rows. The eggs were of a glassy white color and spindle-shaped.

On June 5th but few females were found. The axis of the shoots on which the eggs had been laid were turning brown, and were bending, owing to the death of the tissues in the region of the slits.

Three days later (June 8th) minute larvæ varying from $\frac{1}{4}$ to $\frac{1}{3}$ of an inch in length were found. Their heads and the six true legs were shining jet-black. The larvæ have the habit of curling their tails over their backs whenever disturbed.

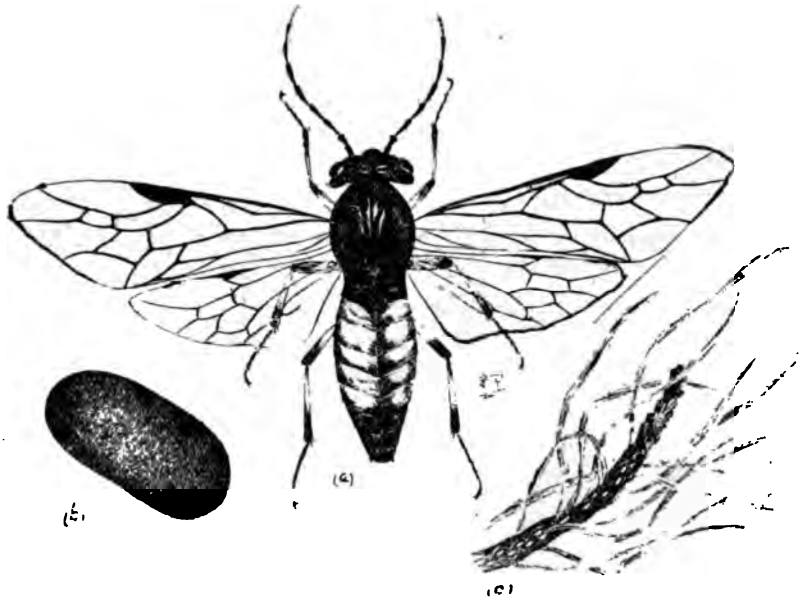

Fig. 9. Larch Saw-Fly. (*a*), the saw-fly with wings outspread; (*b*), the brown pupa case; (*c*) terminal twig of larch showing eggs in slits made by the female saw-fly.

On June 10th the larch grove was sprayed with Paris Green ($\frac{1}{2}$ lb. to the barrel), but as this solution was rather weak, and as many of the trees towards the centre of the grove could not be thoroughly sprayed, or even sprayed at all, the trees were found to be still infested three weeks later.

The larvæ grow rapidly, and at maturity are nearly one inch in length. The defoliation of the larger trees near the centre of the grove was almost complete.

On July 20th no larvae could be found; those that had survived the Paris Green had descended to the ground, and pupated. The oval, spindle-shaped pupæ (Fig. 9 *b*) could be found quite abundantly under the trees among the litter of leaves. These remain in the ground all winter, and the adults will emerge about the end of May.

References:

1844. Ratzeburg—Forest Insects—p. 121.
1881. Hagen—Can. Ent.—p. 37.
1883. Fyles—An. Rep. Ent. Soc. Ont.—p. 17.
1884. Fletcher—An. Rep. Ent. Soc. Ont.—pp. 72, 77.
" Harrington— " p. 68.
" Fletcher—Can. Ent., Nov.
" Fyles—Can. Ent., Nov.
1885. Fyles—An. Rep. Ent. Soc. Ont.—p. 12.
1886. Jack— " p, 16.
1887. Lintner— " p. 32.
1888. Saunders— " p, 31.
1889. Howard— " p. 26.
" Fletcher— " p. 38.

1889. Lintner—Fifth Rep. N. Y. State—pp. 164–173.
1890. Packard—U. S. Ent. Com. V. Rep., Forest Insects—p. 879.
1891. Fyles—Am. Rep. Ent. Soc. Ont.—pp. 28, 30.
1893. Harrington— " —pp. 19, 21.
" Lintner—Eighth Rep. N. Y. State—pp. 168, 169.
1894. Fyles—Am. Rep. Ent. Soc. Ont.—pp. 4, 5.
1896. Marlatt—Revision of the Nematinae of North America—pp. 111, 112.
1898. Hutt—Am. Rep. Ent. Soc. Ont.—p. 94.

Lyda sp.; (Colorado Spruce Saw-Fly.) On May 30th several black saw-flies were observed resting on the leaves of an ornamental spruce, the Colorado spruce (Picea fulgens), on the College grounds. These saw-flies had a wing expanse of one inch and a quarter, while the body was nearly three-quarters of an inch in length. On several of the branches were large masses of castings which were over two inches in diameter. These masses of castings were never situated at the ends of the branches, but about midway on the branches. The leaves in the neighborhood of the castings had been eaten by the large greenish-black larvæ which occupied silk-lined tunnels within the mass. (Fig. 10.)

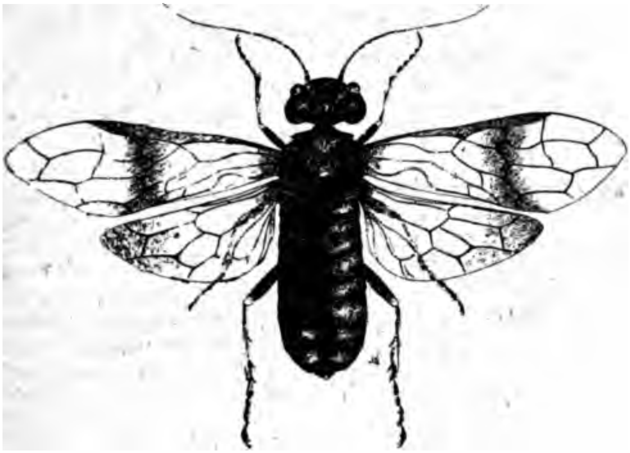

Fig 10.

No eggs could be found at the time the adults were seen. A good spraying of Paris Green was given, since which operation no larvæ have been found. It is evident that the Lyda saw fly is a very destructive insect to this spruce, and should conditions ever arise when the larvæ were numerous, the damage would be very considerable

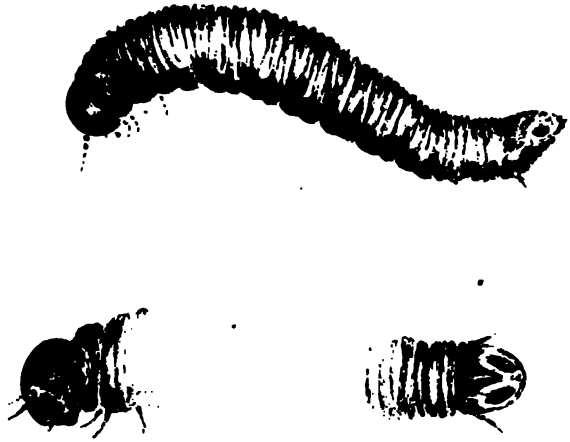

Fig. 11.

The adults are larger than the adults of the larch saw-fly. Their abdomen is depressed and flattened. Their front wings are about as long as the thorax and abdomen together, and across the middle of each wing is a cloudy band. Their feelers or antennae, composed of many joints, are long and setaceous.

Their legs are light yellow in color, as are also the basal joints of the antennae and the mandibles. The tarsi of all the legs have five segments.

The caterpillars (Fig. 11) when full-grown are about an inch and quarter long. The head, the dorsal portion of the first segment of the thorax, and under surface of the whole thorax are black. The body is dull olive-green in color, and very much wrinkled. There is a prominent zig-zag lateral line on each side at the junction of sternite and pleurite. There is also a prominent V-shaped ridge on the upper surface of last segment, and the depressed areas between this ridge and the elevated lateral ridge are black, as is also the lower surface of the last segment. The antennae are short and 7-jointed; the last pair of legs are 3-jointed.

Curiously enough the larva corresponds very closely with an undetermined larva, figured and described by Packard in his *Forest Insects*, page 852. Dr. Packard does not appear to have seen the adult.

THE ELECTRIC LIGHT AS AN ATTRACTION TO MOTHS.

BY ARTHUR GIBSON, ASSISTANT-ENTOMOLOGIST, CENTRAL EXPERIMENTAL FARM, OTTAWA.

A good deal has been written of late years on the many beautiful and rare moths which have been captured while collecting around the electric lights of cities and towns. The attraction that these lights have for moths, especially in situations on the outskirts of a locality, is really astonishing, and the number of different species secured in a single season from a few visits to these lights is very considerable. Much useful work can in this way be accomplished, and many species which are seldom met with otherwise are quite often taken at the electric lights.

On warm, close, rainy-like nights especially, particularly in the month of June, swarms of insects of almost all kinds congregate around the electric lights, varying in size from the large Attacus Cecropia emperor moth, down to the tiniest of species. On cool, raw nights also moths are to be found fluttering around the lights, these conditions seemingly making little difference to them, and on nights when it is even pouring rain many species of moths are observable. Even this does not apparently lessen the attraction which the electric lights have for these insects, and on a visit on almost any night during the collecting season, moths of some kind are sure to be found.

I have often noticed and wondered at the abundance of males, and the scarcity of females around the electric lights. I have taken many males, of numbers of species, but have yet to take females of these, and even amongst our commonest species the males predominate to a large extent. Of course, it must be remembered that the females do not move around or fly such distances as the males do, generally staying near their food plant on which they lay their eggs. The males, on the other hand, being much stronger fly quite long distances, no doubt one reason being their endeavor to search for and locate the females, and in this way they come in contact more readily with the electric lights. Unless, therefore, the electric lights are so situated as to be in close proximity to the food plants, near where the females have emerged, it is likely that the collector would find but few of them. This may be one, and an important, reason for the scarcity of the females around the electric lights.

Many moths have a habit of circling around the electric light, and in a short time alighting on the telegraph pole, where, in numerous cases, they generally rest a long time, in fact, often until daybreak, and I have even found them there at all hours of the day. Specimens which have alighted on the poles are, of course, mostly easily captured, but those which circle round for half an hour, and even longer, tend considerably to try the collector's patience, but in the end he is often rewarded by either netting the specimen after it has circled lower, or else capturing it when with a sudden dart it descends, striking the ground. Quickness, however, is needed in the latter case, as quite frequently the specimen ascends again with as much rapidity as it descended. Sphingidae are particularly quick in this respect, and the collector has to be on the alert, and capture the specimen as soon as it descends. On the other hand, numbers of other moths are quite within reach and easy to catch, as they fly anywhere within the rays of the electric lights, not always flying close to the globe. Geometers are especially noticeable in this regard, and can be taken without much trouble. The large emperor moths have a habit of flapping near the ground, and are then generally easily caught.

The brilliant illumination from the arc lights seems to have a dazzling effect on many species, as after fluttering around for a time they often seek the dark, or shady, side of the telegraph pole, where they are often found resting. This I have noticed among many of the sphingidae, and more often among the arctiidae, the tiger moths being especially conspicuous in this respect. Many of the noctuids also are apparently dazzled, and hide from the light.

I have found that where another pole is within a few feet of the pole from which the electric light is suspended, numbers of "good things" seek a resting place thereon, and these are generally within easy capture. Those out of reach I have often dislodged by throwing up a piece of sod, or else a handful of caked mud. Some collectors use long rods with a net on the end for this purpose, but for my part I have found this a needless trouble, and the appliance is not always easy to handle, and it is difficult and often impossible to place the net just where it is wanted. In Ottawa the electric light poles have iron attachments, which are used by the electric linemen to climb the poles when the carbons require replacing in the globes, or the lamps repairing. It is therefore not much trouble for us to secure specimens which are resting on the poles. In Toronto, where I collected for a number of years, the globes have all to be lowered by the linemen for repairs, etc., and the poles do not have these iron attachments, consequently we had to devise other means whereby to secure the specimens. We first of all tried these long rods with the net on the end, and of course, with this aid secured many moths, but on the other hand many were still out of reach, so we afterwards discarded the long rods and generally secured any specimens we desired by simply throwing a piece of old sod, or caked mud at the moths, dislodging them from their place of rest, when they generally fell to the ground and were quickly bottled. At the entrance to the Experimental Farm at Ottawa is one of the best electric lights that I have ever collected at; within a few feet of this stands a telegraph pole, and during the past summer we took quite a large number of beautiful and rare moths while they were resting upon this pole, a much larger number of specimens being taken off this pole than off the one from which the light is suspended.

The best hours I have experienced for collecting at electric light are from 9 o'clock to about half past 10 o'clock, and after 12 o'clock to about 2 o'clock. I have never stayed later than this but I have been told by collectors who have stopped around the lights all night, that they took very few specimens after the latter hour. The earlier part of the evening until half past 10 o'clock or so seems to be the most productive.

If the collector is interested in breeding moths from the egg to the imago, the electric light furnishes a great help toward this end, as when a female is captured if it is desirable to obtain eggs, all that is necessary to do is to enclose her in a box, when she will, as a rule, deposit at least a portion of her eggs, provided she has not laid them before capture. I have often secured specimens in this way and had the pleasure of breeding the specimens to maturity. As an example I might cite that during the past summer I took a female of Euprepia caja, while collecting at the electric light, putting her in a box alive where she remained the whole night. By the next morning she had laid nine eggs, five of which hatched. I have succeeded in getting two of these larvæ past the sixth moult, and both, on the 9th inst. started to spin a slight cocoon. This occurrence is very remarkable as the larvæ of Euprepia caja are known to hibernate through the winter, but the reason mine have passed through all their stages and spun a cocoon, is probably no doubt due to the fact that they were kept very clean in doors and given fresh food plant generally twice a day. I have taken descriptions of the different stages and will probably later on publish my notes in the Canadian Entomologist. Dr. Packard in his "Study of Insects" says that the larvæ of Euprepia caja moult from five to ten times. At the electric light females of moths are thus secured which might be hard to get otherwise.

While at the electric light, however, the collector has not everything his own way as there is another competitor, whose nature it is to also visit the lights for the purpose of catching moths and other insects. I refer to the bats which frequent the electric lights securing many a desirable species, the wings of which are often found, the bat being seemingly contented with the body portion. The size of the moth does not in the least seem to frighten the bat as I have seen him catch and fly away with as large a species as Telea polyphemus. The moths when chased by the bat make a desperate effort to get away, but in the end they are generally captured. Some, however succeed in evading the bat by flying straight up in the air just at the time the bat makes a swoop upon them. Many a specimen which looks to be a "nice thing" has been caught by these bats, much to the collector's regret. Sparrows also pick many specimens from off the poles in early morning, the moths having rested there until that time. Constant visitors to the electric lights are the toads which hop nimbly along the ground and snap up many a treasure that might otherwise have graced the entomologist's cabinet.

I have brought to the meeting some of the captures which we have been fortunate enough to make at the electric lights during the past summer. These no doubt may be of interest to the members present.

INJURIOUS INSECTS OF THE ORCHARD, GARDEN AND FARM FOR THE SEASON OF 1899.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

The unusual severity of the past winter led many persons to anticipate a reduction in the numbers of injurious insects on account of the probable freezing of many of the forms which hibernate as pupæ or adults, but such an anticipation has not been realized, as most of the pests of past seasons have been quite as numerous and injurious this season.

The Orchard.

The Codling-Worm has again been active, and the damage done to the apple has been very considerable (Fig. 12). In the Guelph section the prolonged showery season during spraying time washed away the Paris Green from the calyx cups, so that the first meals of the young grubs were not poisonous. As there are two broods in the south-west part of the Province the orchardist should see that the first brood is exterminated, for if not, the second brood will do much damage to late apples. Last year many shippers lost heavily on account of the work done by the second brood, which is very hard to combat, from the fact that the members appear at very irregular intervals from August to October.

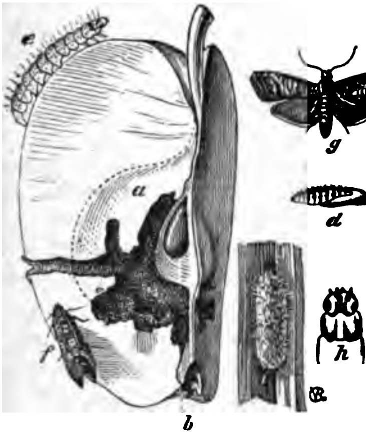

Fig. 12.

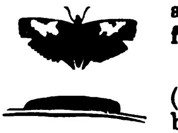
Fig. 13.

The work of the *Bud Moth* (Tmetocera ocellana) on the young buds was very noticeable in some localities where early applications of Paris Green were not made (Fig. 13). Experience has shown that one or two applications of a mixture of Paris Green and Bordeaux before the blossoms open are of great service not only in preventing the entrance of fungi, but also in killing young canker-worms and young bud-worms. The bud-worms, when they emerge from their silken cases in the spring, have shining black heads and the first segment behind the head also black.

Both species of *Tent Caterpillars* (Clisiocampa Americana (Fig. 15) and C. disstria (Fig. 14) were exceedingly numerous during the early spring, and did much harm in many sections. The farmers of the Province require to be aroused in this matter; they appear to make no effort to kill them during the most assailable period, viz., during the winter when the egg.masses (Fig. 15c) can be readily seen and destroyed, and during early spring when the caterpillars are small. Applications of Paris Green are very effective on the young caterpillar, but ineffective on the full-grown.

Many persons are under the impression that some plague comes over the full grown caterpillars when they suddenly disappear. It is true the caterpillars no longer exist as such, but it ought to be borne in mind that they have simply changed into pupæ within white cocoons (Fig. 15d), from which the moths will emerge about July to lay the bracelet of eggs on the twigs and branches.

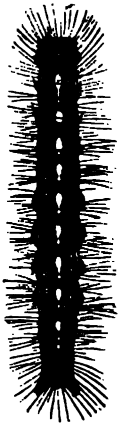

FIG. 14.

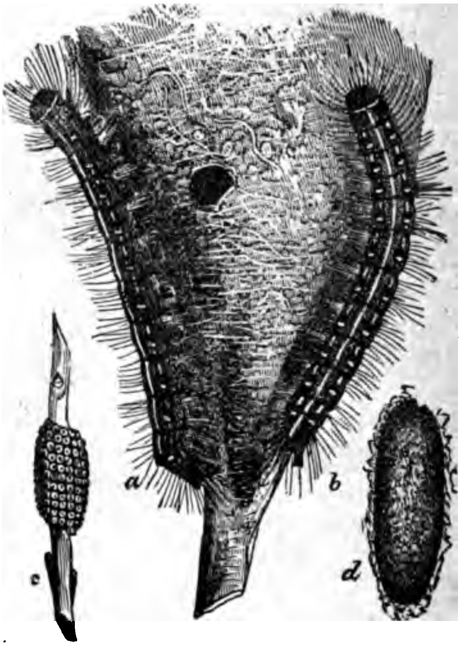

FIG. 15.

Bonuses might be given to the children for all egg-masses destroyed, or all nests burned.

The *Scale Insects* have perhaps become the most serious pests in many districts. The San Jose Scale, which has become quite abundant in two or three localities, as well as remedies for its suppression, will be found fully treated in another part of this Report.

In some localities, chiefly in the San Jose infected areas, is found a scale *Aspidiotus ostreæ-formis*, which is very like the San Jose Scale, but apparently not nearly so destructive Occasionally trees have been found which were quite badly infested, in which cases much harm was being done. Applications of whale-oil soap (2 lbs. to 1 gallon of water) during the winter will prevent the spread of this scale.

The Oyster-Shell Bark Louse (Mytilaspis pomorum) is doing much harm in many orchards which have been neglected (Fig. 16). Frequently specimens of branches were received, which were literally covered with this scale, yet the owners had overlooked its presence, and not until several trees had been killed was expert opinion invited. Applications of whale oil soap (2 lbs. to 1 gallon of water) during the winter, and dilute kerosene emulsion, about the end of May when the young lice are moving, will rid the trees of these pests, and in most cases give a new lease of life to the previously neglected trees.

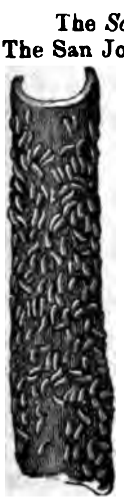

FIG. 16.

The Scurfy Bark Louse (Chionaspis furfurus) is another scale which is too prevalent in many localities (Fig. 17). It can be treated in the same way as the Oyster-Shell Bark Louse.

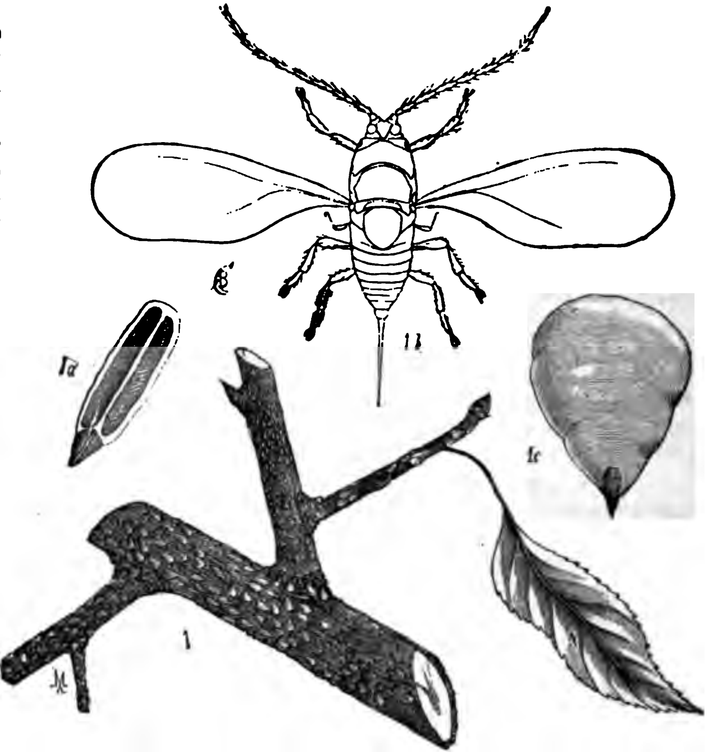

Fig. 17.

The Woolly Aphis (Schizoneura lanigera) This insect is readily recognized by its woolly covering (Fig. 18). It can be readily treated with applications of kerosene emulsion or tobacco water. It infests apple trees.

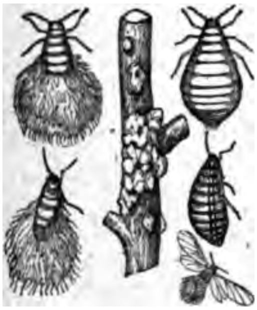

Fig. 18.

The Garden.

Slugs have been unusually plentiful, and those infesting the raspberry and strawberry were extremely troublesome. These are more dreaded than the other insects infesting these plants, inasmuch as they continue their depredations through the fruiting season, when it would be unsafe to use poison for their destruction.

Plant Lice or *Aphids* were quite troublesome on currants and gooseberries. They cause the leaves of the currant to wrinkle; in gooseberries rosettes or tufts at the tips of the branches are formed. Within these tufts can be found Aphids of all ages, and with these are the lady-birds trying their best to subdue them. The figures represent two common forms, Fig. 19 the 9-spotted, and Fig. 20 the 13-spotted.

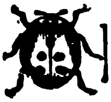

Fig. 19.

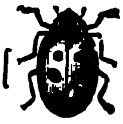

Fig. 20.

The Raspberry Fruit Worm (Byturus unicolor) was more prevalent than usual this year. This small white worm about ¼ inch in length feeds on the flesh of the berry close to the receptacle. Their presence is often overlooked in the preparation of the fruit for the table.

At the College both the raspberry and the blackberry were slightly damaged by the presence of galls on many of their roots, produced by a cynipid (Rhodites radicum). Wherever the galls were present the canes were found to be lying prostrate on the ground and a few died from the effects.

The Colorado Beetle (Doryphora decemlineata) was just as abundant as ever at the College this year, but it has been frequently reported that the severe cold of last winter killed many hibernating adults, and that the supply was much below the normal.

Much annoyance was caused by the presence of a very small black flea-beetle (Epitrix cucumeris) Fig. 21, on both the potato and the tomato plants. This beetle about 1-16 inch in length, is black with a whitish pubescence. This insect works upon the upper side of the leaf and makes perforations. It is easily overcome with Paris Green.

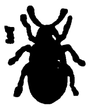

Fig. 21.

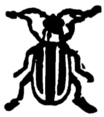

Fig. 22.

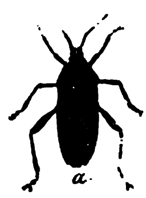

Fig. 23.

The Cucumber Beetle (Diabrotica vittata) Fig. 22, was as usual a great nuisance on the cucumber, melon, squash, and pumpkin vines. Many inquiries were made as to the best mode of dealing with these beetles. The remedy we found to be most effective was Paris Green with considerable lime added, applied with a knap-sack pump. The rod had an elbow so that the under sides of the leaves were thoroughly sprayed. This year applications of Paris Green were made whenever new leaves appeared.

The Squash Bug (Anasa tristis) Fig. 23, seemed to thrive this year in spite of every precaution. Decoy crops are generally very valuable, but were quite ineffective in most cases this year. Hand-picking of the leaves containing the clusters of eggs or nymphs was found very effective.

The Cabbage Worm (Pieris rapæ) was very plentiful this season, and did much damage to cabbage, turnip, and rape plants. In the case of cabbages the worms can be very successfully treated either by Paris Green and lime spray, or by dusting the leaves with insect powder, mixed with flower or ashes.

The Cabbage Aphis (Aphis brassicæ) did not appear in such numbers as they did last year, but the application of kerosene emulsion, diluted with 15 parts of water, to the under side of the leaves will practically exterminate them.

The grape-vine had its usual enemies, but so far as my knowledge goes, the *Flea-beetle* (Haltica Chalybea) Fig. 24, was not so troublesome this year as usual, but it is still considered a bad pest. The best method of controlling it is, (1) to spray with Paris Green the buds which are just opening, and (2) again in June, when the larvæ are active, to spray with dilute kerosene. Many vineyardists go among the vines and hand-pick the beetles, or jar the beetles into a cloth saturated with kerosene.

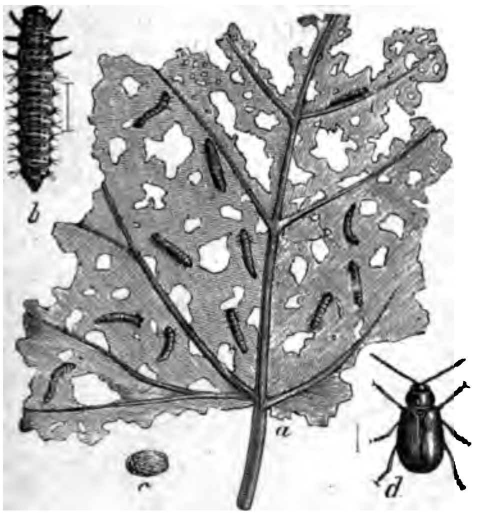

Fig. 24, *a.* larvæ on leaf, *b.* larvæ, *c.* egg, *d.* beetle (magnified).

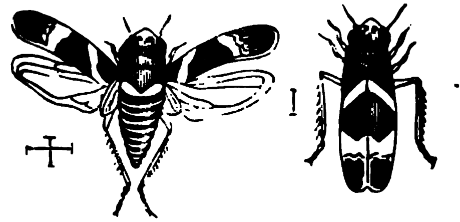

Fig. 25, Grape-vine Thrips (the hair-lines show natural size).

The *Thrips* or *Grape-Vine Leaf Hopper* (Erythroneura vitis), Fig. 25, was perhaps more injurious than the flea-beetle. It was especially troublesome to the Virginia Creeper during late summer. If the nymphs which appear in June are then sprayed with dilute Kerosene Emulsion, and an elbow used so that the spray will reach the underside of the leaves, little harm need be expected for the remainder of the season.

A new and somewhat alarming pest has arrived in the Niagara peninsula. Last year Mr. Kilman noted the arrival of the Asparagus Beetle (Crioceris asparagi) at the

Niagara River. This year it has made itself quite destructive in Lincoln and Welland Counties. Two species preying upon the asparagus have arrived simultaneously, *Crioceris Asparagi* and *Crioceris duodecempunctata*. The latter has a reddish body with black spots, the former steel blue with white spots. W. N. Hutt, B.S.A. has at my suggestion kept a record of the work and life history of the beetles, and has prepared a short paper, which I have pleasure in presenting to this meeting. These beetles were first noticed by Mr. Hutt about May 8th, on the second or third cutting of the asparagus. The larvæ hatch from the eggs in about a week, and change into pupæ in two weeks, and in about ten days later the adult beetle emerges from the ground. There are probably several broods in the season and Mr. Hutt remarks: "The broods of the insects seem to be very numerous and to overlap one another, so that *eggs*, *larvæ* and *beetles* may be found any time during the summer." The same observer states that the best remedial measures would be:

1. Frequent cultivation of the ground to disturb or destroy the insect in the pupa state.

2. The removal of all spindling stalks on which eggs might be deposited.

3. Thorough spraying after cutting has ceased.

The O. 12-punctata was by far the more common form in the Niagara district.

The Farm.

My experience leads me to the conclusion that the insects which usually trouble farm crops were not serious pests in many portions of the Province.

***The Wheat Stem Maggot* (Meromyza Americana) did some damage in some localities. (Fig. 26.) The "White Head" can be readily discerned among the other uninjured stems. Like the Hessian Fly the adult is a four-winged fly which lays its eggs about May 15th, upon the stalk near the top point. The larva burrows into the stalk, and when mature is a worm about ¼ inch long. The flies emerge in July, to lay eggs for a second brood. Dr. Fletcher has determined three broods at Ottawa.**

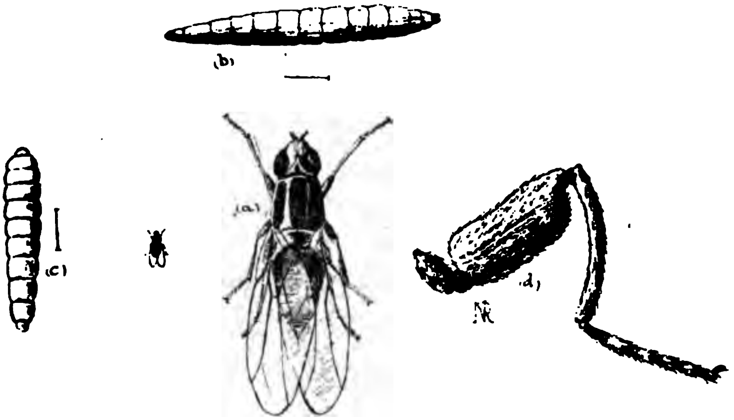

Fig. 26. The wheat-stem Maggot. *a.* The fly. *b.* The maggot. *c.* The pupa. *d.* Hind leg of fly, with large femur.

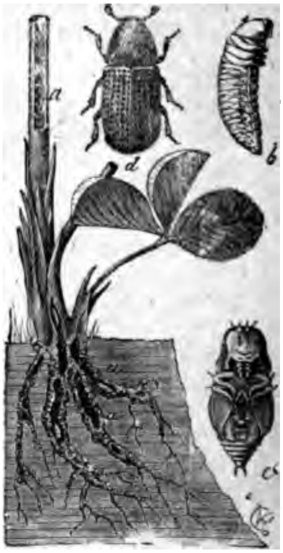

Fig. 27. The clover root borer. *a.a.a.* Excavations made by borer. *b.* grub. *c.* pupa. *d.* beetle.

The pea crop still suffers very heavily from two very important pests, the *pea-weevil*, (Bruchus pisorum) and the *pea-moth* (Semasia nigricana). In Ontario the ravages of the pea-moth appear to be limited chiefly to the Counties of Dufferin, Grey, Bruce and Huron. From a study of its life history it is very probable that the early varieties will not suffer much from the pest, as the larvæ do not appear before the middle of July.

As to the pea-weevil, its ravages are of such great importance that the general adoption of fumigation by carbon bisulphide after harvesting might with much good reason be insisted upon by the Government.

The Clover Root Borer (Hylesinus trifolii), Fig. 27, destroyed many clover crops this year in the vicinity of Belleville. F. R. Marshall, a recent graduate of the College, writes thus: "In early and middle June it was apparent that the red clover was not blossoming properly. Many plants did not blossom at all; many others produced imperfect heads. In fields where the clover was two years old, every plant was affected. In one year old clover a smaller proportion of the plants was injured, but since then the effects of the insect are noticeable all over the field.

I have not found any alsike clover affected. There were some Lucerne plants in the field, but they are not at all damaged.

Until July 12th, I found nothing but adults. On that date I found several larvæ, some well grown which were all in the lower portions of the root, and the beetles up near the crown. There were from 2 to 7 larvæ in a single root and 2 to 4 beetles.

On Aug. 8th, there were still many larvæ; some pupæ, and few adults.

On Sept. 5th, there were some larvae and many adults; the adults being in the lower portions of the root and very inactive.

Stored Grain frequently suffer from the depredations of certain moths and beetles. of which the *Granary Beetle* (Calandra granaria) is perhaps the most troublesome. It is a small brown snout beetle which punctures the outer shell in which she deposits her eggs. The young footless grubs eat the inside of the kernel, and in about six weeks from the time the eggs are deposited the adults appear.

The Saw-Toothed Grain Beetle (Silvanus surinamensis) is occasionally quite a pest. Just lately I received a package of wheat, from a farm near Waterdown, which had been stored, and which was very badly infested with both this beetle and the *Cadelle* (Tenebroides mauritanicus). According to some authorities it is supposed that the *Cadelle* is beneficial rather than harmful, as it preys upon the other pests.

ASPARAGUS BEETLES.

BY W. N. HUTT, B.S.A., SOUTHEND.

Beetles were first noticed May 8th on the second or third cutting of asparagus (two species—one red with dark spots, the other steel blue with light spots). Little attention was given to the insects as they were not numerous and did not seem to eat the stalks at all. The red species was most commonly seen, the blue beetles being comparatively scarce. In a few days the dark elongated eggs were found in scattered patches on the small spindling stalks which were not cut. There were about 12 to 20 eggs in a patch. In a few days the eggs hatched and small dark larvæ resembling the pear slug appeared. They grew rapidly, eating the soft tissue just back of the growing points. On approaching them the larvæ have a peculiar habit of raising their heads and excreting a dark viscid fluid.

At the ends of the plantation adjoining a sod headland, the beetles were found to be much more numerous, owing undoubtedly to the fact that in the sod their pupæ had been undisturbed by cultivation. Here the larvæ attacked the large and marketable shoots and rendered them worthless by eating off the green portions behind the growing point and smearing them over with slimy castings.

After this the beetles were, during each cutting of asparagus, picked off and destroyed and all small and spindling stalks cut away so as to leave no harbor for the larvæ. In this way the larvæ were kept in check but the beetles, in spite of the most careful hand-picking seemed rather to increase.

About the middle of June cutting was discontinued and the whole bed, rows and all, cultivated up deeply with a large field cultivator. All stalks were then allowed to grow and in a couple of weeks there was a growth of between three and four feet in height. No attention was given to the insects as it was thought their time of doing damage had passed and that the plantation had top enough to suffer no injury. In the third week of July however it was found that a new brood of larvæ had developed and was working vigorously at the tops of nearly all the plants. They worked from the growing point downward, eating all the green portions as they went. On July 31st the whole plantation was thoroughly sprayed, using 4 oz. Paris green to 50 gallons of water, with 2 or 3 lbs. of lime to act as a fixitive. For a few days after many slugs could be found and it was thought that the spraying had not been very successful. However, in a week or so as the insects worked down they came in contact with the poison and were killed. As the summer was very dry this mixture stayed on all season and further damage from the insects was entirely stopped.

In some unsprayed plantations which I observed, the insects stripped the plants till they looked as white and bleached as they would in the depths of winter. I heard some gardeners remarking how the drougth had withered up the asparagus and they could not believe that it had been eaten off by an insect. Some plantations where the insects were at work showed a distinct line of demarcation between the deadened tops eaten off by the slugs and the green portion below that was not yet reached.

The broods of the insect seem to be very numerous and to overlap one another so that eggs, larvæ and beetles may be found any time during the summer. The pupæ I have not found but I expect they are in the ground.

The destruction by the insect is very general owing to the gardeners not knowing the insect or seeing its destruction till their plantations had been stripped. A few odd beds, however, can be found where the beetles seem to have missed them.

I should judge that owing to the destruction of the green stalks and leaves the elaboration and storing up of nutriment in the crown for next year's crop would be seriously interfered with, and that next spring the owners of unsprayed plantations might expect a reduced crop and one composed of rather spindling stalks.

From my experience I think that the best remedial measures would be :

1. Frequent cultivation of the ground to disturb or destroy the insect in the pupa state.
2. The removal of all spindling stalks on which eggs might be deposited.
3. Thorough spraying after cutting has ceased.

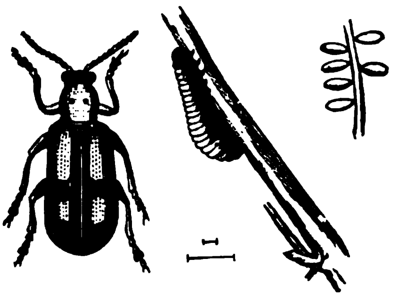

Fig. 28 (much magnified).

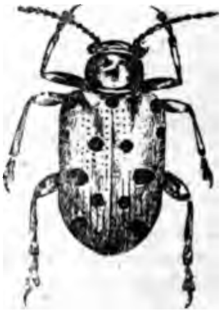

Fig. 29 (greatly magnified.)

These asparagus beetles are new to Canada and proved to be *Crioceris asparagi*, Linn. (Fig. 28), and *C. 12 punctatus*, Linn. (Fig. 29). The latter species was the most numerous.

Prof. Webster said that it was remarkable that this insect, the twelve-spotted beetle, should have overtaken *C. asparagi*, which started for the east on its march across the country many years earlier, both being emigrants from Europe. He had observed that insects of this kind spread more rapidly westward south of the lakes than farther north The asparagus beetle had been found in south-west Michigan by Mr. Pettit, but he had not been able to trace it west of Sandusky in Ohio. The twelve spotted species had reached Buffalo. He mentioned also the almost total disappearance of the Harlequin Cabbage Bug (*Strachia histrionica*) in Ohio this year. Last year it was very abundant but its numbers had apparently been greatly reduced by the severe winter.

FATAL BITE OF AN INSECT.

By Rev. C. J. S. Bethune, London.

During the past summer paragraphs appeared repeatedly in newspapers all over North America giving alarming accounts of the attacks of some marvellous insect upon the human person. The creature was called "the Kissing Bug" in consequence of its alleged habit of biting or stinging the lips of its sleeping victim and causing very painful if not fatal results. Much distress was caused among timid and nervous people and every unfamiliar insect, especially if large or ugly, was regarded as a specimen of the dreaded creature. Specimens of perfectly harmless insects (a *Cicada* for instance) were sent to the writer from various parts of Ontario with the expectation that they were veritable "kissing bugs" and he was enabled to allay these groundless fears in several quarters. Every entomologist had a similar experience and a list of the insects sent in on the supposition that they were representatives of the foe would be a long and amusing one.

On the first of September the following paragraph appeared in some Toronto papers and was speedily copied by a number of newspapers throughout Ontario:

"Kissing Bug's Bite Fatal.—Uxbridge, Aug. 31.—Roy Stevenson, the four-year-old son of Mr. George Stevenson, carpenter, of Udora, was bitten on the calf of the leg by a kissing bug on Thursday last. Dr. McDermott was called, but despite his best efforts blood-poisoning set in and the child died last night."

Here at last was a definite case with locality, names and date. I accordingly wrote to Dr. McDermott, whose address is Sunderland, Ont., asking whether the statements in the paragraph were correct, and if so, for a loan of the specimen in order that it might be identified. He very kindly replied as follows: "I will pack and send the insect as requested for identification. The boy died five days after being bitten. The part bitten was very painful from the first and the symptoms all through his illness were those of profound blood-poisoning. The little fellow was in good health when bitten and killed the insect immediately after it stung or bit him. His mother kept it rolled up in paper and gave it to me. It was bruised and damaged badly; you will notice that the legs are broken and most of them gone and one wing is in the bottom of the box. It was over five-eighths of an inch in length but has dried and shrunk greatly. I may say the case is clear against the insect, whatever it is, as its bite was the direct cause of the boy's death." Some days later the doctor sent me the specimen and added: "We have not pronounced it 'the Kissing Bug,' and do not know what it is. It bit the boy under the left knee and the leg became very painful and swollen. He died from profound blood-poisoning on the fifth day. He was in good health previously."

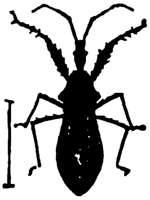

Fig. 30

With the assistance of Mr. Moffatt and the Society's collection, the insect though somewhat damaged, was identified as a specimen of *Sinea diadema*, Fab., which is the same as *Sinea multispinosa*, Am. and Serv. and *Reduvius raptatorius*, Say, who figures it in his "Entomology" (Le Conte's edition, vol. 1, plate 31; description p. 72, and vol. II, p. 249). It is a true bug of the order Hemiptera and family Reduviidæ, called "Assassin bugs" by Prof. Comstock from their habit of preying upon other insects. (Fig. 30.)

The specimen before us is a long narrow insect, dull brown in colour; the head is very long in proportion to the body, and much narrower, with a series of spines above; there are also numerous short blunt spines on the thorax, and a double series of sharp spines on the underside of the front pair of legs; the beak, with which it punctures its victims and sucks their blood, is long, three-jointed, and when not in use bent under the head, its tip resting in a groove between the fore-legs; these legs are very long, and adapted for seizing and holding its prey.

This Reduvius is a well-known insect, and is usually classed among the beneficial species from its habit of preying upon other insects, for the most part of an injurious character. It requires to be carefully handled, however, as it is quite ready to defend itself and inflict painful stings with its beak. Mr. J. Alston Moffat relates that on one occasion, some years ago, he captured a specimen, and held it between his finger and thumb, while with the other hand he searched for a pin. During the interval the bug took the opportunity of doing what it could in its own defence. Throwing its head well back it released its beak from the socket, and then forced it into Mr. Moffat's finger; not content with one puncture, it continued to draw back its head, and then force the beak down again into the wound, causing intense pain, until its human victim was able to get rid of it. He says that it was the severest sting he ever experienced during his many years of collecting; the pain extended up his arm, which became swollen to the elbow, and continued to be painful all night, while the wound on the finger did not disappear for several weeks. It is not likely that the insect injects any poison through its beak, as is done by the fang of a venomous serpent, but probably there remains adhering to it some of the juices of its previous victim—grub, caterpillar or what not—which have become decomposed, and thus poisonous to the blood. In this way we may account for the fatal effects of the puncture in the case of the child at Udora. As this is a rare, if not a unique, instance, the public generally need not feel any uneasiness regarding the so-called "kissing bug," and may rest assured that they are not liable to any new attacks upon their persons by venomous insects of a novel and malignant kind.

DR. FLETCHER said that the scratch of a pin has been known to induce blood-poisoning under certain circumstances, and it might well be that this bug's bite would only be serious after it had been feeding on some decomposed animal matter. Some years ago it was reported that a man was stung by an insect when working in nightsoil, and died from blood-poisoning shortly afterwards.

MR. MOFFAT understood that the use of poison by insects was for the purpose of stupefying their prey so that they might feed in safety. He had observed these insects in contest with flies as large as a bumblebee, which could not be controlled unless stupefied.

PROF. WEBSTER said that the bite of one Hemipteron, *Melanolestes picipes*, was very severe. He had experienced it once from a bug that he held in his hand, and was not likely to forget it, the pain was so great.

DR. BETHUNE mentioned that Dr. Cowdry, one of the original members of the Society, told him that many years ago in England he had been hastily summoned to attend a brewer's carter, who had been stung on the lip by a large hornet. The patient was a very stout man, who had evidently lived largely upon beer; blood-poisoning set in, and the man died the same night. A few years ago at the famous Johns Hopkins hospital, Baltimore, a boy was brought in suffering from the effects of a mosquito bite; every effort was made for his relief, but without success and he died shortly afterwards. These cases serve to show that the condition of the patient must often have much to do with the effects of the stings or bites of insects.

REMARKS UPON SOME CUBAN INSECTS.

By J. Alston Moffat, London, Ont.

On May 3rd, 1899, I received the following letter, which proved to be the introduction to a much valued correspondence; and the package containing the wasps referred to in it, was but the first of a series from the same source, containing numerous interesting examples of Cuban entomology, which have formed quite a valuable addition to the Society's exotic collection.

Santiago de Cuba, March 17th, 1899.

Entomological Society of Ontario.

Gentlemen;—I am sending you under separate cover a few specimens of wasps, which have a kind of root growing from them. I send you these to tell you of the belief here among the natives that the "Llana" a bush full of thorns has its origin from dead wasps. This affair was explained to me by Dr. Gundlach as being simply a fungus growth; it is quite acommon thing to find in the dry season, about February, a whole nest of these insects on the ground, all of which have these roots. I have also seen them with the leaf—always dry—on the roots. The specimens I send you are not very good, they only having one root each, but I have not at present any better ones, and as the rains have already begun I shall not be able to get any more till next dry season.

I might also mention that the Tarantula or "Arana Peluda" as it is called here, is supposed to give birth to the "Sarza" a vine with some very sharp thorns.

It is rather interesting to notice how the natives connect the sting of these insects with the thorns of the plants, and they will not be convinced that they are wrong.

I hope this may be of interest to you. I have never seen the Tarantula with the roots, but shall keep a lookout for them next season, and may be able to send you a specimen.

Yours truly,

Chas. T. Ramsden.

A few days later the box came to hand with the specimens in fairly good condition; the fungus growths projecting from them conspicuously. The wasps are of medium size, exquisitely formed and beautifully ornamented in brown, black and yellow, but the colors lose much of their brightness when the insects are dried.

My first consideration was to obtain the name of the species, and for that purpose I sent an example to Prof. W. H. Ashmead, of the United States National Museum, Washington, D. C., who kindly and promptly forwarded to me the following letter in reply to my inquiry:

SMITHSONIAN INSTITUTION, UNITED STATES NATIONAL MUSEUM.

May 18th, 1899.

DEAR SIR:—Your favor of the 8th inst., together with the wasp came promptly to hand. The specimen you sent me is the male of *Polistes lineatus* Fabr. a species widely distributed throughout the West Indies and South America. By some it is considered only a variety of *erinitus* Felton, but so far as I can see it is a good species and ought to be kept separated.

Yours very truly,

WM. H. ASHMEAD.

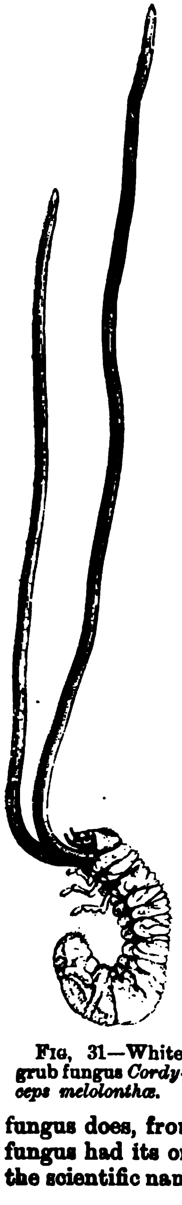

FIG. 31—White grub fungus *Cordyceps melolonthæ.*

Vegetal parasitism, in one form or another is not an unusual occurrence in insect life. The Silk Industry of France was at one time threatened with complete destruction, by a form of it attacking the Mulberry Silk-worm, *Bomby xmori.* Illustrations of the effect of one form may be seen in specimens of our common housefly. Another form is known as the white-grub fungus; this white grub being the larval stage of the common May-beetle, *Lachnosterna* Sp. An interesting account of that form is given in the "American Entomologist," Vol. 1, page 92. In a letter from Mr. S. H. Y. Early given there, I quote the following particulars. "In the spring of 1842 I observed in what is called "New Ground" in Virginia a great quantity of these mushrooms, and in reply to some remarks I made about them, some of my father's negroes who were then making hills with hoes for planting tobacco, enquired of me if I knew what produced these mushrooms. On my replying in the negative, I was informed that they grew from the white grub worm (Fig. 31). I think there were some twelve or fifteen negroes present, all of whom concurred in the statement, and said it was no new thing to them. They had no difficulty in establishing the truth of what they stated, because they dug them up in all their stages of germination and growth before my eyes. In a very short time they had furnished me with a large number of the worms in their original shape, features and size, and as distinct to the eyes as if they had been alive, but having the consistency, color and smell of a mushroom; and I actually broke them up, just as a mushroom breaks in one's hands, snapping them crosswise and squarely off." At one time it was hoped that this fungus disease might be propagated at pleasure, for the destruction of the white grub in meadows, but so far it has not proved to be practical.

One can easily conceive of fungus spores vegetating on the soft body of a grub, but it is difficult to understand how they could obtain a foothold on the hard chitinous covering of these wasps. In another letter Mr. Ramsden informed me that they suspend their nests on a branch of a bush, so they cannot be specially exposed to contact with moisture; and yet they seem to be specially liable to this fungus attack, as shown by the following quotation from the paper previously mentioned: "According to Dr. Carpenter, it is not at all unusual in the West Indies to see wasps (genus *Polistes*) flying about with plants of their own length, projecting from their bodies." And again, in "The American Entomologist," vol. 3, page 138, when speaking of the species of fungus of the genus *Torrubia* which affects the white grub, Prof. Riley said "We have in our cabinet some interesting specimens of this stage affecting wasps of the genus *Polistes*, originating just as the White grub fungus does, from the base of the mandibles." In those received from Mr. Ramsden, the fungus had its origin in the immediate vicinity of the front pair of legs. With regard to the scientific name of the fungus affecting the wasps, Mr. Dearness did not find any of them in a sufficiently advanced stage to enable him to determine it, and Prof. Riley said : "It is never safe to assume the identity of a fungus of this character unless it can be studied when mature, especially as there are at least a couple of dozen species of *Torrubia* known to inhabit insects." Mr. Ramsden informed me, that as the wet season had set in, he would not be able to get any more for some time.

Amongst other material received from Mr. Ramsden, was a pair of that occasional visitor to this locality, *Dilophonota ello*, Fab. belonging to the Sphingidae. He had taken the caterpillars in large numbers, feeding on a plant familiarly known there as "Lechero." Some were of a reddish-purple color, but the majority were green. He quoted Gundlach as saying they were destructive to the yucca crops in Cuba, they are also found on the papaya (Carica papaya), but there is a parasite that attacks the larva, *Microgaster flaviventris*, which keeps them in check. Mr. Ramsden bred a *dipteron* from his pupa, specimens of which he sent to me, but it has not yet been determined.

Also three specimens of *Chloridea virescens*, Fab. which he had bred from larva taken on Tobacco plants. Mr. Ramsden quoted from Dr. Gundlach's "Entomologia Cubana," the following about the larva of *virescens* : "Some were placed in a cage together with some of *Danais* ; Virescens attacked and ate the latter, also eating each other ; and some he held in his hand bit him." The border of the hind wings of the moth is usually blackish, but in one of those received from Mr. Ramsden the border was beautifully tinged with red. Mr Bice took a single specimen of this southern insect in London at light in the season of 1896.

Of things received from Cuba, and occasionally taken in Canada, were specimens of *Terias nicippe*, *Eudioptis hyalinata* and what appeared to be *Junonia coenia*.

Mr. Ramsden sent for identification and to be returned, as it was his first and only specimen of a rare insect, which he had taken at light, a most singular looking creature. At first glance it suggested a butterfly and Dragonfly combined, as if made up for the purpose of deception. It had conspicuously stout antennae, about an inch and a quarter long, and heavily knobbed at the end, resembling those of a butterfly, with the long, narrow, and clear reticulated wings of a dragonfly. Upon close examination and comparison I was convinced that it belonged to the Ant-lions, and through the good office of Dr. Bethune I was enabled to send to him the generic name of the creature. The Doctor called my attention to Westwood's Introduction to the Modern Classification of Insects, vol. 2, p. 41, on the Order Neuroptera, Family Myrmeleonidæ, where there is a cut showing stages and parts of a variety of species, and amongst the parts is an antenna corresponding exactly to those of Mr. Ramsden's specimen, and on page 45, Prof. Westwood referring to the figure says : "The genus *Ascalaphus*, Fab. is remarkable for the peculiar structure of its antennæ. which are very long and knobbed like those of a butterfly, (fig. 63, 21.), whence Scapoli and others described one of those insects as a Papilio." I see by the Eleventh Report of the N Y. State Entomologist, page 239, that there are six species of *Ascalaphinæ* listed by Banks as occurring in the United States ; five are southern forms, and one is found as far north as Massachusetts. It is supposed that the larvæ of this genus do not make pitfalls. Several observations have been reported of the females depositing their eggs on twigs of trees and blades of grass, and that the young lie in wait under sticks and stones to seize their prey. An instance is given of a Ceylonese species, *Ascalaphus insimulans* that makes no pitfalls. "Some young ones were found ranged in a single row along the stem of a lily with the abdomen of each covered by the one behind it, and with their jaws widely extended : in this manner they waited for their prey to literally walk into their jaws." Reference is made to some interesting notes published by Prof. Westwood in the *Transactions of the Entomological Society of London*, 1888, concerning this genus. It was a great pleasure to have the opportunity of looking at so strange a creature, and it would be yet more gratifying to be in possession of one.

THE WING STRUCTURE OF A BUTTERFLY.

BY J. ALSTON MOFFAT, LONDON, ONT.

Anosia Archippus, Fab. is, according to Dr. Buckell, of London, England, who gave much time and careful consideration to the investigation of this much disputed subject, the correct scientific name of our common milkweed butterfly, which, after several years of comparative scarcity in this locality, again appeared in great abundance during the season of 1899.

There are several questions yet unsettled by entomologists concerning the life history of this most noticeable, and usually one of the commonest of our butterflies, that require clearing up, and which tend to throw a halo of mystery around this familiar insect, which gives it special interest in the eyes of all who take delight in observing the ways and works of living objects in nature around them. Some things concerning it have been fully established; for instance, it is now a well known fact that *Anosia Archippus* cannot survive the winter, in any stage of its existence, in Ontario or northward of it. That each recurring winter sweeps our country clear of this particular species, and it has to be restocked every spring by immigrants from the south; just how far south of our Dominion it has to go before it can live through the winter has not yet been satisfactorily settled. That it migrates southward in the autumn in immense bodies, sometimes numbering millions, is well known, and has been frequently observed; therefore it must return in the spring, but by scattered individuals, to take up the territory it vacated in the fall. Dr. Scudder says it belongs to a distinctively tropical group of butterflies, and that north of Philadelphia it clearly appears like an interloper. He also claims that it is a long lived insect; that a female starting northward may travel for weeks, depositing her eggs as she goes, a few at a time, until she reaches the northern limit to the growth of its food plant *Asclepias*. Dr. Scudder also holds that no *Archippus* born northward ever lays eggs the same season.

Mr. W. H. Edwards says that there are three or more broods in the season of *A. Archippus* in Virginia, and he does not consider it to be an unusually long lived butterfly; which caused him to remark that if it had such a lengthened period of existence in the mature state as Dr. Scudder claimed for it, then instead of giving it the common name of "The Monarch," a more appropriate name for it would be the "The Patriarch." Prof. Riley's idea was that fertile females of the hybernating groups in the south started northward in the early spring, when the milkweeds were ready to receive their ova, and would travel some distance before they had finished ovipositing, when these would naturally perish; then their progeny would continue to advance and carry on the work of producing ova to stock the milkweeds as they come on in the north. Thus, there might be several broods required in a season to reach the northern limits of its food plant. I have not yet formed any decided opinion upon these different views, for as much observation and consideration as I have given to the subject, some of my observations sustaining one side, and some as strongly supporting the other.

The wonderful power for sustained flight over long distances of Anosia Archippus is now well substantiated; individuals having been frequently seen at sea hundreds of miles away from land. That a longer term of life in the mature state than is allotted to butterflies generally, to enable it to fulfil its seasonal functions seems to be required; for if the same individuals that leave the north about the end of August or beginning of September pass the winter in the south, and then return northward in the early spring to deposit their eggs for the summer's brood, it would give them a much longer active life in the mature state than falls to the lot of butterflies that hybernate in this region. Whether any of those passing the winter in the south, reach the far north the following season is yet open to question.

I have seen specimens arrive in the spring in a sorely faded condition, indicating age and exposure to the weather, followed by others that were comparatively fresh, as if they were younger and less travel-stained than the first. Then again, I have seen the first arrivals in fairly good condition, as if they had not been long upon the wing. Such observations start the questions: were any of these specimens hybernators from the south, or were they the progeny of hybernators? Then from how far south had they come? Again I have seen specimens haunting a particular locality for weeks, and as far as I could judge by their gradually fading colors they were the same individuals; had these permanently settled down in that locality, to go no further north? Again, I have seen them flying plentifully for six or eight days and then begin to pair; indicating that these particular individuals had not laid eggs before reaching that locality. I have seen fresh-looking specimens flying at the time the new brood was emerging from the chrysalis, and so fresh as to give rise to a difference of opinion, as to whether they were previous arrivals or bred on the spot? I have seen quite small caterpillars on the milkweeds when others had passed into the mature state; all of which have convinced me that there is more than one wave of migration northward during the breeding season.

These statements prove nothing, but they will help to indicate where the missing links are situated, which yet require to be forged to complete the chain of the life history of this particularly interesting creature; and will serve as a guide to those who are inclined and have the opportunity, to continue the observations, and make the evidence positive rather than presumptive.

Ever since the season of 1894, when I first discovered that the upper and under membranes of a butterfly's wing could be separated from each other, my desire has been to make further investigations in the matter, so as to prove or disprove what I thought I learned at that time. Then with the appearance in abundance of *Anosia Archippus* in the early season of 1899 I fondly hoped that my opportunity had arrived. The first one I saw was about the middle of May, in an unusually battered condition, and from that on until about the end of June they kept increasing in numbers, till they were to be met with everywhere. I requested friends to endeavour to secure for me a number of nearly full-fed caterpillars from the milk weed, so that I might have plenty of material with which to prosecute my investigations. Mr. Balkwill was the first to respond, on the 22nd of July, with a newly transformed chrysalid and several large caterpillars, which were followed by more from the janitor of the Y.M C.A. Then I made a trip on the street car to a common in the vicinity of his residence, where *Asclepias cornuti* was growing in profusion, and I secured yet more, so that before the first had emerged I was in possession of fourteen pupæ, and Mr. Balkwill added four more to the stock subsequently, and they were all required.

The great advantage in procuring this particular species for such an investigation is not so much on account of its numbers in an abundant year, or the ease with which it can be fed up, but in the character of its crysalid, which is a pale translucent green, whilst the butterfly is a bright brown with black veins and white spots. These colors when the pupa is approaching its crisis show through the thin transparent pupa-case, which gives one an opportunity of clearly observing the progress it is making towards maturity, when it can be arrested at any stage desired; or, with a little practice, one can tell within a few minutes of the time when it will burst its bonds, and so obtain warning to be on hand to witness its disclosure and development, and then secure it in the proper condition, for the purpose intended.

I was surprised at the amount of mortality there was amongst the caterpillars after suspension; although I had been prepared to expect something of the sort from reading the chapter on "The critical periods of it's life" in Dr. Scudder's book, "The Life of a Butterfly." But there is no intimation given therein of the disease that afflicted my stock; which manifested itself by the caterpillar becoming flaccid, the skin opening and fluid escaping and forming long silky threads. If one of them hung its head straight down I knew it was doomed, and the other symptoms soon followed. It extended to some of the chrysalids. There were no indications of parasitism in my lot. The time from the formation of the pupa to the emerging of the imago was ten to fourteen days. In no instance did any that I saw emerge drop from the pupa-case to cause it to expand its wings suddenly. They came out of their case apparently with great caution and deliberation; and it took them from ten to fifteen minutes to fully expand their wings. The temperature of the weather through nearly all the period of their emergence was on the cool side, especially the nights, which would tend in some measure to restrain their energies.

It would be profitless to relate the difficulties I had to encounter in the prosecution of my investigations; and how I had to gain my information for success through failures in my efforts to accomplish the object in view; but it may be of use to anyone who wants to prosecute the enquiry to know what I learned during the process.

For the examination of an unexpanded wing, the chrysalid should be allowed to mature as nearly as possible to the point of emerging before it is killed, which I did by placing it in alcohol; then it is the better to hang for twelve hours for some of the moisture to evaporate. For the comfortable handling of an expanded wing, after full development it should be allowed to obtain complete firmness, which may take an hour or two, before killing the insect and separating the wing from the thorax. The only place that I could find an entrance for a pin point between the membranes, was at the base of the wing, where the subcostal and median veins come close together; when once the pin has entered, either in a vein or between the two, it can be moved back and forth through the entire width of the wing without encountering the slightest obstruction. The upper and under membranes of the wings are at the front and hind edges all in one piece, and must be cut to get them apart, which can be done by running the pin down through them, and so delicate are they, that this can be done without feeling that any extra pressure is required. Because of that extreme tenderness I had some difficulty in obtaining conclusive evidence as to the actual structure of the outer angle of the wings, until I bethought me of getting water between the membranes. With great care, after many trials, I succeeded in inserting a fine glass tube at the base of a wing, and soon had water flowing into it. Resting the wing on the surface of a tumbler of water, it soon rounded out like a bladder; but as soon as the water touched the outer angle the bladder collapsed, all the water having gone together, and the membranes were as before it entered. This sac will not hold water, the membranes being finished and fringed independently of each other at the outer angles.

The greatest difficulty in getting the membranes separated, and in getting them to stay apart arises from the gummy nature of the fluid that has entered between them from the thorax. If one separates a part of the wing and lets it go again, the sides are instantly as closely united as they were at first: or if a portion of the membrane folds in upon itself, one is far more likely to tear it than turn it back, in their efforts to straighten it. My available material had become reduced to three chrysalids, and I had not then obtained a perfect example, and was beginning to wonder if the effort was to prove a complete failure, when I thought of trying to separate them under water, and found it to work admirably. I could then separate the membranes without difficulty or danger; when separated I floated each half on to a bit of oiled paper, transferred them to blotting paper with their outsides next to it, then allowed some of the superfluous moisture to evaporate before covering them and putting them under pressure to thoroughly dry, when they came out in perfect condition.

The fluid which had been stored up in the thorax of the pupa flows in between the membranes of the wings at the opening by the subcostal and median veins, passing along and expanding them as it goes until the wings have attained their full dimensions; the fluid as it dries becomes more gummy and adhesive, and when perfectly dry the butterfly's wing with which we are all familiar is completed. The veins and nervures are situated half in one membrane and half in the other, the heaviest portion being in the upper membrane and open in the centre; so there is every reason to believe that the fluid does pass into, and through between them as it does between the membranes, but when it dries it forms such a thin coating on their inner sides that it practically leaves them empty. Then when the fluid has quite dried it has cemented the two halves together, which form the hollow tube that has been the subject of so much discussion; whilst at the same time it tends to stiffen and strengthen them as it does the membrane. Here I have the opportunity of correcting myself in a statement I made of what I thought I saw in an unexpanded wing. Twenty-fifth Annual Report of the Entomological Society of Ontario, page 65, where I state that "The nervures are in the upper membrane, with a groove in the lower opposite, into which they fit." That appearance I found frequently produced, by the walls of the larger veins in the upper membrane clos ing together on the inner side; but their true structure can be clearly demonstrated in an unexpanded wing. And here I will express the opinion that the term "veins" is inappropriate and quite misleading as to their purpose and use.

The most recent statement upon this subject that has come under my notice is in an article by Henry Charles Lang, M.D., M.R.C.S., L.R.C.P., London, England, in the August number of *Science Gossip*, 1899, page 71, from which I will copy the paragraph headed, "The Vascular System:"

"This in butterflies is of a very simple character. The centre of the circulation is a rudimentary heart called the 'dorsal vessel,' situated on the dorsal surface of the abdomen and divided into several chambers. It is controlled by muscles attached to the abdominal walls, and by their action the blood is propelled into the aorta, which is a prolongation of the dorsal vessel, having the form of a tube passing through the thorax to the head. The blood then returns through the lacunae or interspaces of the various organs to the abdominal sinus which surrounds the dorsal vessel and thence into the vessel itself through special valvular openings. There are, in insects, neither arteries, capillaries, nor veins in the true sense of the word, and the blood is cold, colorless and not corpusculated. As above stated, it is usually held that in butterflies *the nervures of the wings convey the blood to these appendages*, until they are fully unfolded after the emergence of the insect from the pupa. Circulation through these then ceases, the texture of the wings becoming dry and nonvascular. The nervures then perform the functions of air tubes." The italics are mine, and what I desire to call attention to is, that it is now time to cease disseminating that bit of misinformation. We have now attained to a fairly clear conception of the wing structure of this particular butterfly, and the question now to be settled is, are all butterflies' wings constructed on the same principle? It seems highly probable that they are, but positive proof is wanted; and I now consider it an easy matter to get it by anyone who can obtain a specimen in the proper condition. And as an inducement for anyone inclined to follow up the subject, I would recommend it to them as a most fascinating field of observation, and one well calculated to yield profitable results.

The photograph for the plate prefixed to this volume, was taken by Mr. R. W. Rennie, London, Ont., who, amongst his other accomplishments, is an expert amateur photographer.

DESCRIPTION OF THE PLATE.

Fig. 1. Presents the inner sides of upper and lower membranes of a front and hind wing. These were separated under water and the gummy fluid washed off so the color of the outer surface shines through.

Fig. 2. The inner side of the lower membrane of a front wing.

Fig. 3. The hind wing of a male, disclosing the inside of the sexual spot.

Fig. 4. The inner side of an upper membrane of a front wing.

Fig. 5. The inner side of the lower membrane of a female's wing. These four membranes were separated as best I could before I tried it in water, the gummy fluid over the whole inner face of the membrane giving them a whitish appearance, as if they had got a thin coat of varnish.

Fig. 6. Shows the inner sides of the two membranes of an unexpanded front wing, with the basal portion of the costal membrane not separated. Its exact length is five-eighths of an inch.

Fig. 7. Gives a view of the natural size of a perfect front winglet. The opposite one is incomplete.

Fig. 8. The underside of a hind winglet. The opposite one is the upper side of another; both imperfect.

Fig. 9-10. Are the wings of one butterfly. The length of front wings from base to apex is two inches, by one and a quarter wide at the outer angle.

Upon one occasion, when engaged in separating some of the membranes, the inner sides of which, upon being exposed to view, had a reddish, raw appearance, a friend who had been intently watching the operation for a time, turned away with the remark, "Well, it's got down to a pretty fine thing now, when you've taken to skinning them!"

NATURE-STUDY LESSONS ON THE CABBAGE BUTTERFLY.

(*Pieris rapae.*)

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

INTRODUCTORY NOTE. The purpose of the following Nature-study Lessons on the Cabbage Butterfly is to furnish information and question hints, regarding the structure and life-history of one of the most common insects of our Province, to those teachers who would like to introduce Nature Study into their schools, but are prevented from doing so by a lack of knowledge of insect structure and habits.

Nearly all insects begin with the egg stage. From the egg emerges the *larva*, (called *maggot* in the case of flies, *caterpillar* in the case of moths and butterflies, *grubs* in the case of many beetles, and *nymph* in the case of grasshoppers, plant lice and half-winged insects.) The larva moults, or changes its skin, as it grows, the number of moults varying with the individual insect. The larva of the moths, butterflies, beetles, flies and wasps, on reaching its full growth transforms into a passive creature and sometimes spins a *cocoon* about itself, as in the moths; or becomes a *chrysalis*, as in the butterflies; or makes a case within which it may rest quietly as a *pupa*, as in the flies and wasps. The nymphs of the grasshoppers do not transform, but with each successive moult become more like the adult insects. The adult form is usually winged, and is known as the *imago*, in the case of the butterflies and moths.

Nature-study lessons must be very informal in their nature. Their object is to make children observe, and to draw proper conclusions from the observations; to make them see what they are looking at, and to arouse an interest in the world of nature about them.

True teachers will find that the best objects for Nature-study are the most common objects about them. For this reason the Cabbage Butterfly has been taken in this case, and it is the sincere hope of the writer of these lessons that many teachers will make at least a beginning of this work, and give these most informal studies a fair chance among the other studies of the school.

Reference is here made to an article by the writer, entitled "Entomology in Schools," published in the last annual report of the Ontario Entomological Society, 1898, in which the names of the most important works on insects are given.

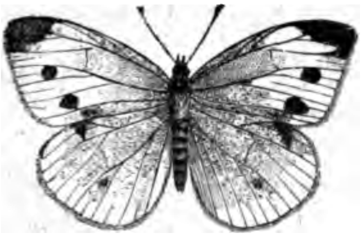

FIG 33.--The Female Cabbage Butterfly.

Every child knows the pretty white butterflies, which are so common in September in gardens and along roadsides. These flit about from flower to flower, evidently not caring much what kind they visit. The despised dandelion, the execrable blueweed, the ubiquitous yarrow, the notorious thistle are each in turn visited for the sake of the nectar or honey they contain. But September is not the only month when these white butterflies (Figs. 32 and 33) are abroad. As soon as the snow has melted in March, many of them may be seen flying about, lured by the bright sunshine into leaving their comfortable winter quarters for the deceptive breezes of early spring. With a relapse to cold weather many a poor butterfly is frozen to death. Those that have been rendered only torpid the returning hot sun's rays bring back to life again.

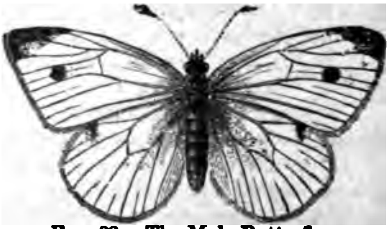

FIG. 32.—The Male Butterfly.

From their appearance in spring till autumn there is not a month when they are entirely absent, for there are three broods during the summer, and many of the late ones of one brood will be found flying with the early ones of the succeeding brood.

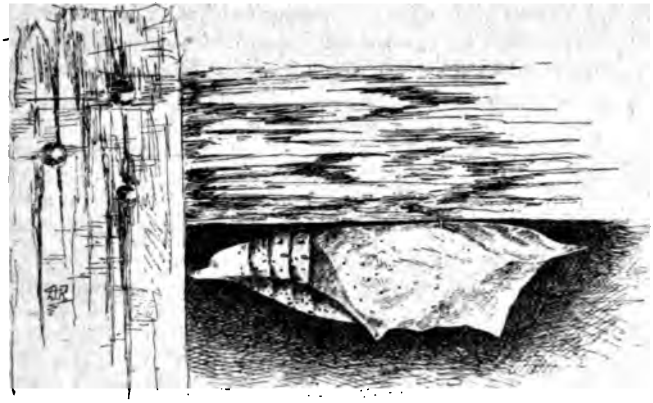

Fig. 34.—A Chrysalis of Cabbage Butterfly, showing the slender silken band by which it is slung up to the fence rail. The posterior end is attached to upright post in this case, but usually it is attached to the horizontal board. The projections of the wings, the legs and the coiled tongue are prominent.

(Fig. 34.) The cabbage butterfly winters over in the chrysalis state. A little search in late autumn will reveal many of these chrysalids suspended under the covering boards or rails of fences which enclose fields of turnip or rape. It will repay one to observe carefully, and make notes of, the peculiar shape of a chrysalis. It is about four-fifths of an inch long, and is generally of a light grey, or brown color. It is suspended at two points—at its pointed posterior end and at the middle of the body, by a silken cord that forms a band by means of which it is slung up tightly to the board or other object. The chrysalis case is quite thin and apparently brittle. The wings, coiled tongue, and legs can be fairly well recognized within the case. Every pupil should watch carefully the way the white butterflies emerge from chrysalids which have been collected.

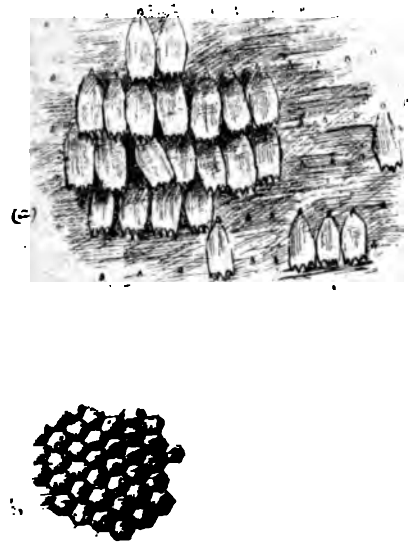

Fig. 35.—(a) A few scales on the wing, showing the shape of scales, their arrangement in rows, and overlapping, (much enlarged). (b) a portion of large eye, much enlarged, showing hexagonal facets.

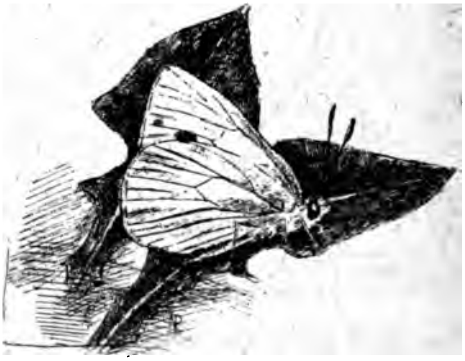

Fig. 36.—An Imago of Cabbage Butterfly at rest on a leaf, showing the wings folded over the back, the three pairs of legs, the prominent eyes, and the long club shaped antennae.

The white butterflies have six well-developed legs, and four wings covered with scales (Fig. 35, *a*) which brush off very readily. (Do all butterflies have six well-developed legs? Do all winged insects have scales on their wings?) If we examine several specimens we shall very likely find slight differences in the number of black spots on the fore wings. The female butterfly (Fig. 33) has two black spots while the male (Fig. 32) has only one. We shall notice also that when the butterfly is resting on a flower the wings are held erect, (Fig. 36). (Find scale-winged insects which fold their wings by their sides when at rest.)

The antennae or feelers are thread like, and club shaped at the ends. (Have all butterflies and moth similar feelers?) The eyes are quite prominent, and if they are examined with a strong lens a large number of facets (Fig 35, b) will be seen. Such eyes are said to be compound.

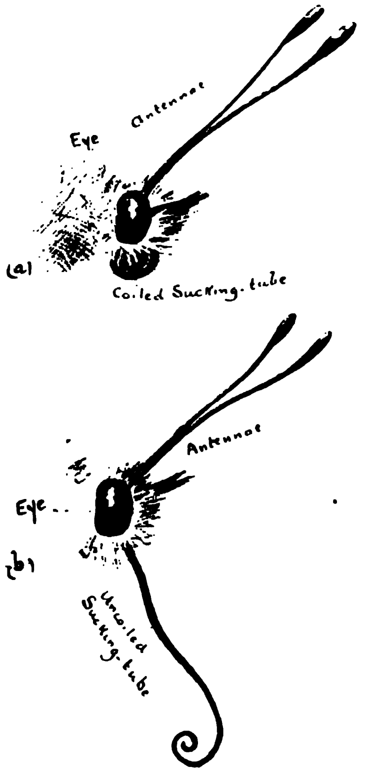

Fig. 37.— (a) Head of Cabbage butterfly, showing eye, long antennae and coiled sucking tube. (b) Head with sucking tube uncoiled.

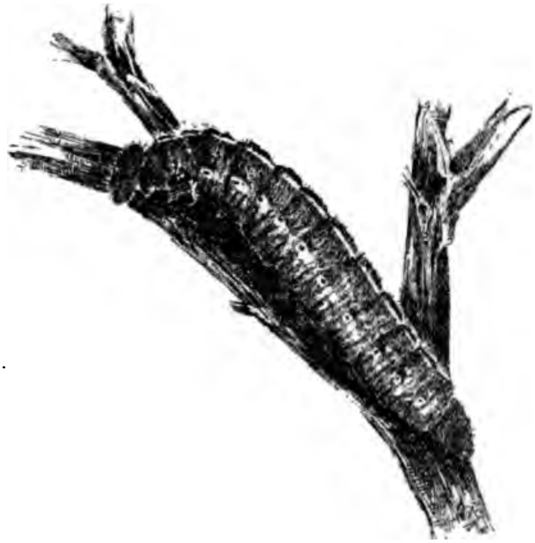

Fig. 38.—A Cabbage Worm, showing the yellowish band along the back, the breathing pores, and yellowish dots along the sides, the three pairs of true legs in front, the five pairs of prop-legs behind, and the hairs and black dots on the back. (Somewhat magnified.)

Perhaps the most interesting structure of the butterfly is the long sucking tube which is usually coiled up like a watch spring, (Fig. 37, a). If we observe a butterfly while on a visit to a flower, we shall find that the sucking-tube is uncoiled (Fig. 37, b) and thrust into the corolla, and that the nectar is sucked by means of little muscles acting on a bulb or sac at the base of the tube. The process resembles that by which water is drawn up through a straw inserted in the mouth.

The eggs are laid by the female butterfly on the plant which serves as food for the caterpillar. Pupils should look on the underside of the leaves of cabbage, turnip, rape, mignonette, and other cruciferous plants for the pale yellow, flask-shaped, erect bodies, and examine carefully with a lens to find the vertical ribs on the eggs. The teacher should direct attention to the fact that the eggs are seldom placed in clusters but are somewhat scattered.

In about a week the tiny caterpillar comes out of the egg. (Note how long it takes to become full grown, and how often it moults). The color is green like its food-plant. All should examine carefully and find the yellowish band along the top of its back, the row of yellow spots along the sides and the fine black dots on its body. When full grown the caterpillar is nearly an inch in length. (Fig. 38). Then there are indications that another change is about to take place. (What are some of these indications? Where do you generally find the chrysalids?)

Very frequently in the autumn many cabbage-worms present a distended and sickly appearance. They are sluggish and have no desire to eat. If some of these *worms be put in a* box and taken to the house, where they can be observed frequently, the cause for the sickness will soon become apparent. Small white maggots will bore their way out through the skin and congregate about the poor caterpillar as in Fig 39, *a*; and if these maggots be watched, it will be found that they soon begin to spin silken cocoons about their bodies (see Fig. 39, *b*.) The caterpillar has sometimes sufficient vitality left to crawl away from its tormentors an inch or two; but most frequently it dies beside them, and in a day or two no trace of its body can be found. If these cocoons be placed in a tin box for a few days, minute four-winged flies (Fig. 39, *d*) will emerge through a lid-like opening at the end of the cocoons. (Fig. 39, *c*.) These flies are parasites; they lay their eggs within the body of the cabbage-worms by inserting their needle-shaped ovipositors through the skin. In a short time the eggs hatch minute maggots, which grow and feed within the body of their host until they become full-grown, when they emerge as already described. It is very likely that the majority of cabbage worms suffer death through the agency of parasites. Even the chrysalids are not immune from the attacks of these parasites; for if many be examined, the interior of the case will in some instances be found filled with small maggots. Moreover the butterfly is eaten by many birds and other animals; so we are forced to conclude that the Cabbage fly has to contend with many enemies during its life-cycle (Fig. 40); that there is a constant struggle for existence, and only a small fraction of the entire brood is left to propagate the species and to molest the farmer and gardener.

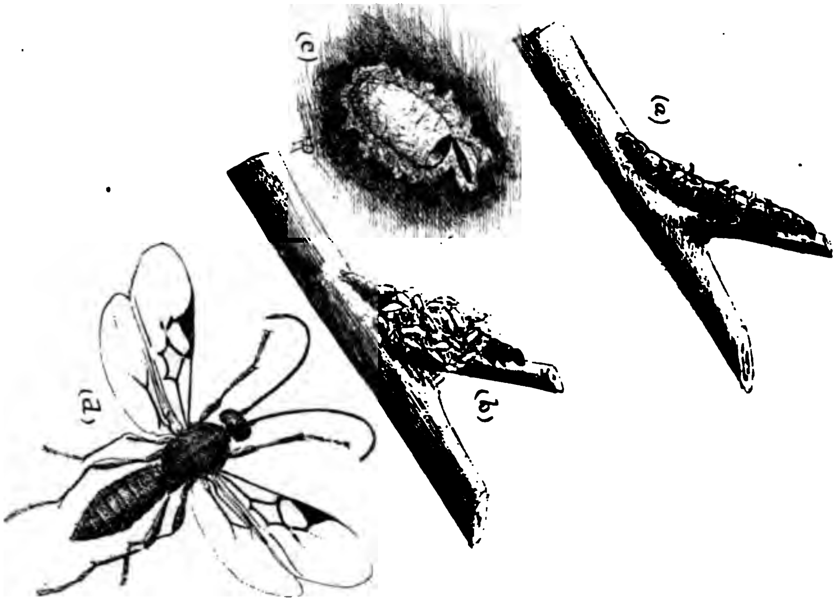

FIG. 39.—(*a*) Cabbage-worm with maggots escaping through the skin; (*b*) The maggots have transformed into pupae within cocoons; (*c*) One of the cream-colored cocoons with the lid-like opening; (*d*) The adult parasite fly which emerges from the cocoon, greatly magnified.

The respiratory or breathing apparatus of insects is rather peculiar. If a large Cabbage-worm be examined many openings may be seen along each side of the abdomen in the same line as the yellowish dots (Fig. 38.) These openings are the terminations of tubes which ramify through the body and supply air to the interior, so that an interchange of gases can take place, and the blood be purified.

A good practical method of killing the Cabbage-worms is to dust a mixture of one pound of insect-powder and five pounds of flour through a cheese-cloth bag upon the infested plants. The fine powder of the mixture clogs the breathing pores, and prevents the access of air to the interior of the body, so that the worm is virtually suffocated.

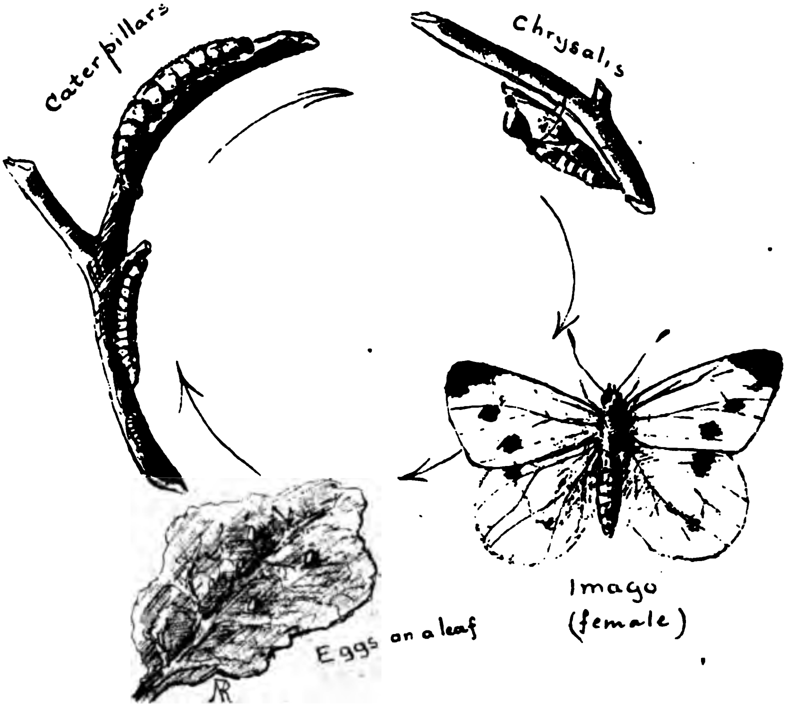

FIG. 40.—The four stages in the butterfly's life-history are represented, eggs, larvæ or caterpillars, chrysalis and imago.

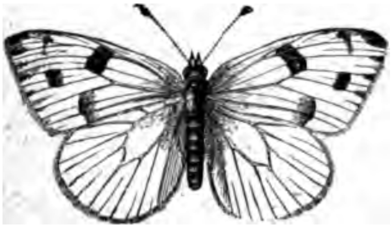

FIG. 41.

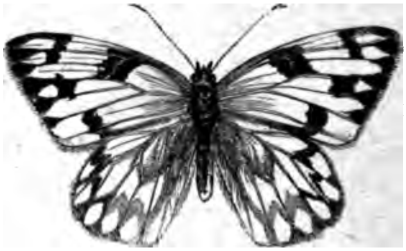

FIG. 42.

The common Cabbage-butterfly is not a native of this Continent, but has been imported from Europe within recent years. It reached Quebec about 1860; in 1863 it was quite common about Quebec; in 1867 it was in Montreal; in 1868 it spread from New York where it had been introduced from Europe; by 1881 it had spread throughout the eastern half of Continent; by 1886 the Rocky Mountains had been reached; and now it roams from the Atlantic to the Pacific. It displaced the native species (Pieris protodice), Figs. 41, male, 42, female, driving it before it; bu after thirty-six years of occupation the same native form re-appears with renewed vigor, and gives signs of competing successfully with the intruder.

LESSON I.—THE EGGS

Leaves of cabbage, turnip, or rape with the eggs should be collected. On which side of the leaves are the eggs found? Of what advantage? What is the shape of the eggs? The color? What kind of an insect lays these eggs? What kind of creatures hatch from these eggs? Do they resemble the mother insect? How long before the eggs hatch? (It is important that the pupils should have the eggs under observation. If possible the study should be made on the objects in the fields, under natural conditions, but leaves might be brought into the class room).

LESSON II.—THE CABBAGE-WORMS.

A supply of cabbage-worms should be on hand, and if possible a piece of half-eaten leaf with the worm at work before each pupil.

1. Why are some of the worms larger than others
2. Describe the markings.
3. How many legs has the worm? Describe their location. Are all the legs of the same structure?
4. Describe how the worms eat.
5. What method of destroying the worms would be possible?
6. Watch carefully to find out how often a worm moults.
7. Follow closely the movements of a worm which has become full grown and has become restless.
8. Watch the large worms which have become sickly and have begun to change color, for the appearance of small white maggots. Where do these maggots come from? What change comes over the maggots?
9. Describe how a caterpillar breathes.
10. What would be the result if the breathing pores were plugged or stopped up?
11. Try the effect of spraying Paris Green water on some caterpillars. What objection is there to the use of Paris Green?
12. Dust some insect powder mixed with about five times as much fine ashes, through a cheese-cloth bag on some caterpillars, notice the effect.

LESSON III.—THE CHRYSALIDS.

A collection of chrysalids should be procured from the fences surrounding cabbage, turnip, and rape fields.

1. How are the chrysalids attached to the fence rails?
2. How long does this insect remain in the chrysalid condition
3. Which surface of the chrysalid touches the surface of rest?
4. What signs of wings, etc., are to be seen?
5. Open some chrysalids to find if all are living.
6. In the dead chrysalids what do you find? How did the maggots get inside?
7. Locate accurately 25 chrysalids in the early winter; and in late winter, determine the number left. What has happened to those that have disappeared?
8. What then are some of the enemies?

LESSON IV.—THE WHITE BUTTERFLIES.

1. In what month did the first butterfly appear? If possible watch for its appearance.
2. When did the butterfly emerge from the chrysalid kept in a box in your room? Can you account for the difference in time?
3. Number of wings? Of legs? Number of parts to each leg?
4. How does the butterfly hold its wings when at rest.
5. What is the nature of its mouth? Can it eat? For what is its mouth adopted? Watch how a butterfly feeds.
6. Are the wings of all the white butterflies spotted alike? What does this difference indicate?
7. Has this butterfly any enemies? Name some.
8. Of what use are the scales on the wings?

LESSON V.—OTHER WHITE BUTTERFLIES.

For this lesson the native Pierids should be shown the pupils. The differences should be seen. The teacher should then give the pupils a short history of the introduction of of this white butterfly to America, and its subsequent spread.

1. How would you distinguish the cabbage-butterfly from the *Gray-veined White and the Checkered-White*?
2. Collect caterpillars of each species, and learn to distinguish them.
3. Upon what plants does the caterpillar of the *Yellow*, or Clouded Sulphur Butterfly feed.

SPIDERS.

By Rev. Thomas W. Fyles, F.L.S., Levis, Quebec.

Spiders are not generally regarded as pleasant objects. I think most people have an antipathy to them. They dislike their appearance and their ways. At an entertainment given in a village that I know, songs, recitations and tableaux were intermingled. In one of the last named a little child was seen seated upon a hillock with a bowl of curds in her lap. She had been instructed to behave prettily and to take no notice of the people before her, but one thing she had not been prepared for. Suddenly a large toy-spider with all its legs dangling was let down, by an elastic thread, before her. Her start of unaffected terror was inimitable, and was warmly applauded, but of course this representation of little Miss Muffett could not be repeated. Yes, children regard spiders with fear, and older persons regard them with disgust; and yet there is much in spiders that is worth our notice, as I hope to show in the course of this paper.

Spiders are not insects. They belong to a different order, the *Arachnidæ*, which includes scorpions, ticks, mites &c., as well as spiders.

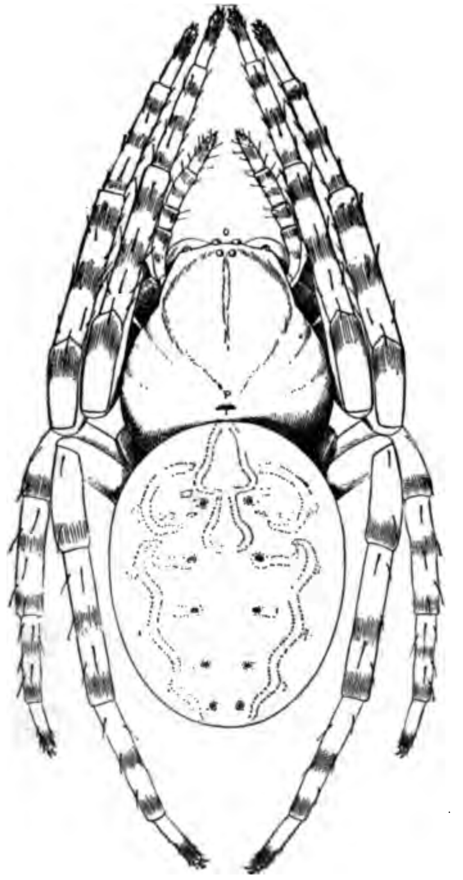

Fig. 43.

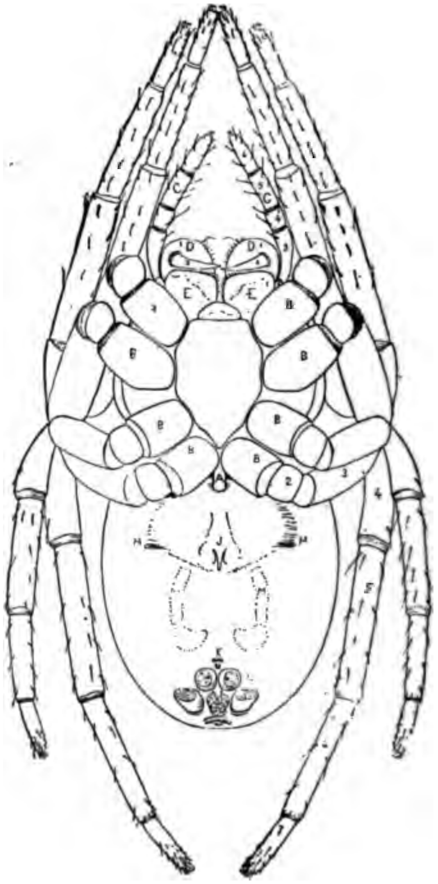

Fig. 44.

The word Arachnidæ is derived from the Greek Mythology. Arachne, as the story runs, was the daughter of Idmon, a Lydian. She was a skilful spinner and weaver, and was vain enough to enter into a contest with Minerva, who invented the arts Arachne practised. The ambitious mortal was defeated, and in her vexation hanged herself, but was turned by the gods into a spider.

Spiders differ from insects in the under-mentioned, as well as in some other, respects.

(*a*) In the spiders the head and thorax are united in what is called a cephalo-thorax. In the insects the head and thorax are distinct. (Fig. 43, upper surface of a spider; fig. 44, lower surface—both much enlarged).

(*b*) Spiders have no wings.

(*c*) They breathe by means of lung-sacs, through tracheæ which open under the abdomen.

(*d*) Their eyes are simple, not compound as in the insects.

(*e*) They have eight legs. Insects proper, in their perfect state, have only six.

(*f*) Their abdomens have no segments.

(*g*) After leaving the egg they grow, *but undergo no metamorphoses.* The insect passes from larva to pupa, and from pupa to imago.

Spiders have been divided into three tribes, according to the *number* of their eyes:[*]

I. OCTONOCULINA—Eight-eyed spiders.

II. SENOCULINA—Six-eyed spiders.

III. BINOCULINA—Two-eyed spiders.

The families are named in most cases from *the habits of the species* they severally include.

Thus in the first tribe among others are found:—

The Salticidæ or Leapers (Fig. 45).

The Thomisidæ, or Binders (Fig. 46. The arrangement of the eyes is shown below).

The Drassidæ, or Seizers (Fig. 47).

The Linyphiidæ, or Weavers (Fig. 48), etc., etc.

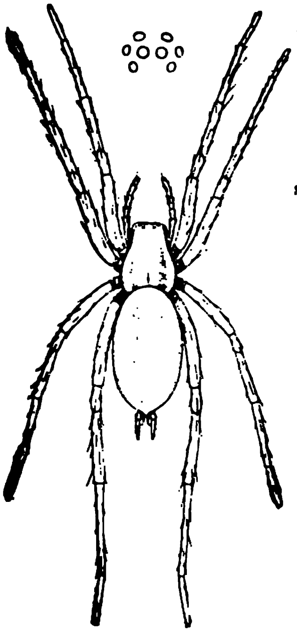

Fig. 48.

The *form, colour and arrangement of the eyes* assist the naturalist in determining the genera of spiders, thus:

The genus *Sphasus* has two large and six small eyes.

The genus *Salticus* (Fig. 45) has the eyes in three rows.

The genus *Philodromus* has them in two crescents.

The genus *Pholcus* has the eyes on prominent black spots, etc., etc.

The species are determined from *peculiarities of form, colour and markings.*

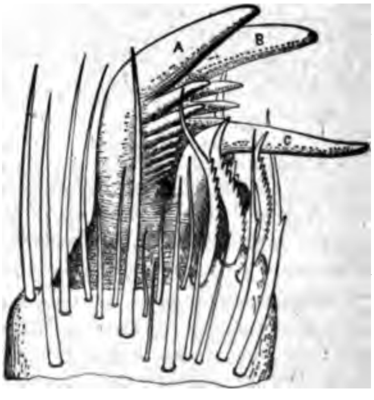

Fig 49.

The spider has eight seven-jointed legs, terminated in every instance with three toothed-claws (Fig. 49), or with two such claws and a brush (Fig. 50). This may fitly be called *a hand-brush*, for the creature uses it for dusting its web.

Projecting from the spider's head are two six-jointed palpi, which are so large that they might almost be mistaken for another pair of legs; and between these are the for-

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[*] Blackwall's "Spiders of Great Britain and Ireland."

midable mandibles (Fig. 51) toothed on the inner side, and furnished with fangs (*falces*) (Fig. 52) connected with a poison-gland. When the spider strikes a foe the virus is conveyed into the wound through a small opening in the fang (Fig. 52*a*).

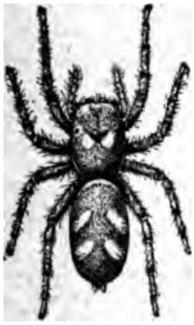


Fig. 45

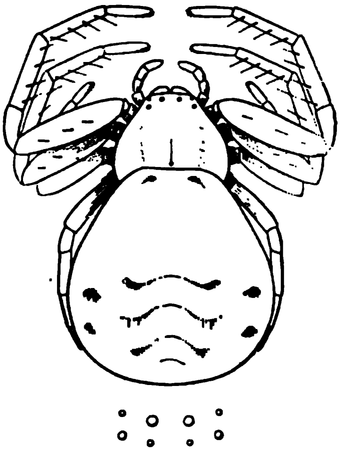


Fig 46.

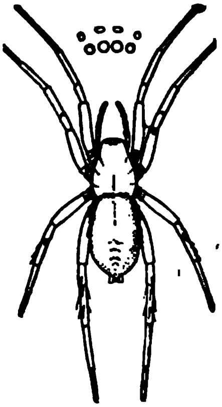


Fig. 47.

Behind the mandibles on the under side are the maxillæ or chewing organs. That the spider sometimes uses these without exercising its mandibles I know from experience.

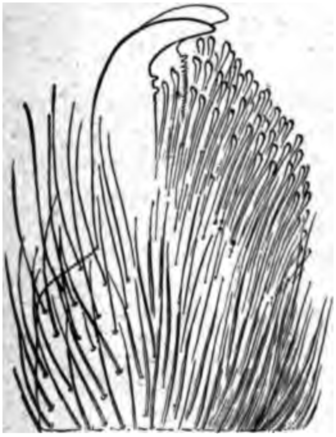


Fig. 50.

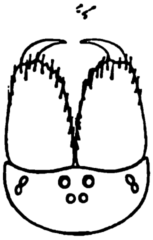
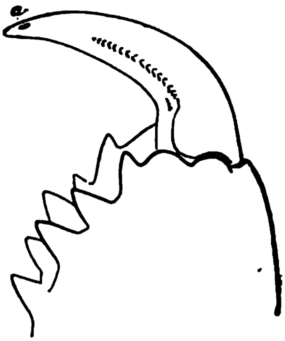


Fig. 51.



F'g 52

I was sitting one day, intent upon a book, when a tickling sensation on the back of my hand diverted my attention. I glanced down, and saw that a large spider was biting me. I shook the creature off, and found a cup-shaped hollow—into which I could have dropped a mustard seed—where it had chewed away the flesh. Beyond a little passing irritation, I suffered no ill effects from the bite.

When the fangs of the spider are used upon a human being the effects may be exceedingly unpleasant. I know a little girl who was wounded in the neck by a black spider. The flesh became greatly swollen and much discoloured, and the child was very ill. She was under the doctor's care for ten days.

The silk-bag of caterpillars is near the head; and the silken thread passes through and is controlled by the jaws of the insect. The spinning organs of spiders are near the other extremity of the body (Fig. 53). Inwardly they consisted of a number of glands,

and of tubes connected with these glands. The latter are gathered into clusters in the six outward spinnerets. The threads from all the tubes unite in the spinning, and yet in combination they form a thread so fine that it is only one-fifth the size of a silk-worm thread. It is so perfect that it has been used for marking divisions in scientific apparatus, for taking measurements of extreme delicacy and exactitude.

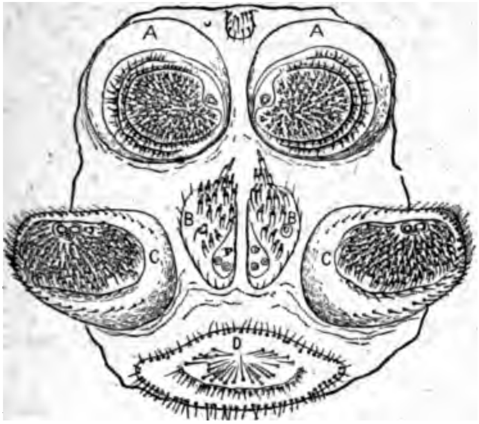


Fig. 53.

The female spider is generally much larger than the male. They do not live in the same nest, for the lady is of a capricious temper and has been known to fall upon and devour her mate. Indeed the cannibalistic tendencies of spiders are among the hindrances to rearing them with a view of employing their silk in manufactures.

There are, however, several species of spiders that frequent cellars, and that are of more peaceable dispositions than many of their kind; and these have been reared for a strange purpose. Fraudulent vintners after bottling and laying down their wine in cellars, have been ready to purchase spiders by the hundred at good prices. Set at liberty in the cellars of these men the spiders have speedily covered bins and bottles with a drapery of web that has conveyed the idea of age, and imparted a fictitious value to the wine.

The expedition with which spiders form their webs has ensured, it is said, on several occasions, the safety of fugitives. At a time of religious persecution in Europe. a man seeking a refuge crept into an oven, and a spider immediately commenced to spin its web before the door (Fig. 54). Before the pursuers arrived, its work was so far advanced that the men passed by the oven, remarking, "No one has entered there." A somewhat similar story is told by the Jews in regard to David, when he was in hiding from Saul, in the Cave of Adullam.

The perseverance of spiders in forming their webs under difficulties is remarkable. The well-known story told by Sir Walter Scott concerning Robert Bruce and the spider exemplifies this, and has thus been versified by Eliza Cook:

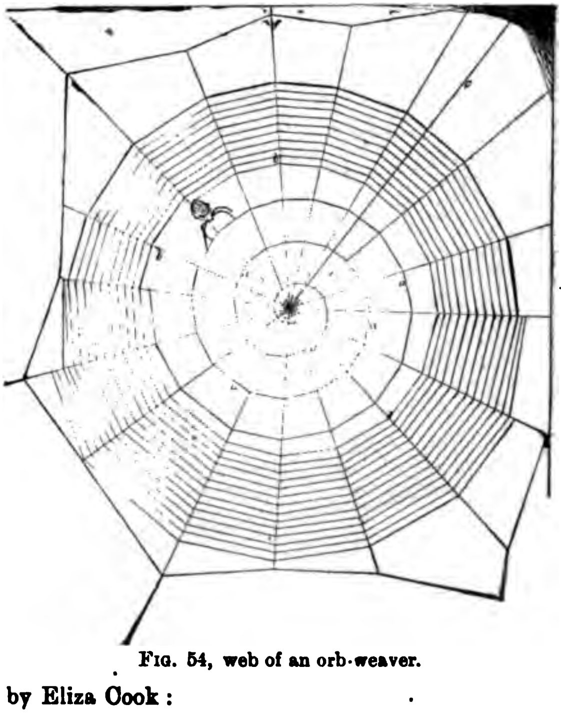


Fig. 54, web of an orb-weaver.

BRUCE AND THE SPIDER.

King Bruce of Scotland flung himself down in a lonely mood to think
'Tis true he was monarch, and wore a crown, but his heart was beginning to sink,
For he had been trying to do a great deed to make his people glad,
He had tried and tried, but couldn't succeed, and so he became quite sad.

He flung himself down in low despair, as grieved as man could be;
And after a while as he pondered there, "I'll give it all up," said he.
Now just at that moment a spider dropped, with its silken cobweb clew,
And the king in the midst of his thinking stopped to see what the spider would do.

'Twas a long way up to the ceiling dome, and it hung by a rope so fine,
That how it would get to its cobweb home, King Bruce could not divine.
It soon began to cling and crawl straight up with strong endeavour,
But down it came, with a slipping sprawl, as near the ground as ever.

Up, up, it ran, not a second it stayed, to utter the least complaint,
Till it fell still lower, and there it laid, a little dizzy, and faint.
It's head grew steady—again it went, and travelled a half yard higher,
'Twas a delicate thread it had to tread, and a road where its feet would tire.

Again it fell and swung below, but again it quickly mounted,
Till up and down, now fast, now slow, six brave attempts were counted.
"Sure," cried the king, "that foolish thing will strive no more to climb,
When it toils so hard to reach and cling, and tumbles every time."

But up the spider went once more, ah me, 'tis an anxious minute,
He's only a foot from his cobweb door, oh say, will he lose or win it?
Steadily, steadily, inch by inch, higher and higher he got,
And a bold little run, at the very last pinch, put him into his native spot.

"Bravo, bravo!" the king cried out, "all honor to those who try;
The spider up there defied despair, he conquered, and why shouldn't I?"
And Bruce of Scotland braced his mind, and gossips tell the tale,
That he tried once more as he tried before, and that time he did not fail.

Pay goodly heed, all you who read, and beware of saying "I can't,"
'Tis a cowardly word, and apt to lead to Idleness, Folly and Want.
Whenever you find your heart despair of doing some goodly thing,
Con over this strain, try bravely again, and remember the Spider and King.

The spider's web (Fig. 54) so frequently represented in pictures is that of the Geometrical Spider, *Epëira diadema*. It is formed with great regularity and is a beautiful object. Strange to say it is made up of two kinds of silk. The long, convergent, anchoring threads are not viscid, but the cross threads are thickly set with minute gummy drops, which secure the unfortunate insects that strike upon them.

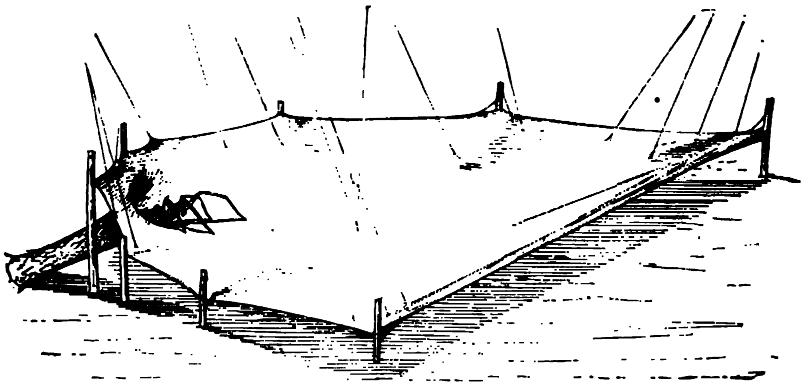


FIG. 55.

There is a species of spider (*Agalena labyrinthica*) which forms a closely woven web spread horizontally over the surface of the ground, and having a retreat at one corner of it (Fig. 55). It has been said of this, that, in the early morning, when the webs are white with dew, one might fancy that the fairies had been having a washing-day and had spread their sheets over the meadows to dry.*

The Gossamer Spider, *Neriene vagans*, often sets a fine silken thread floating at haphazard on the air. (Fig. 56). When this becomes entangled at the further end the spider secures the nearer one, and makes use of the thread as a bridge by which to

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**Mr. Mygale's Hobby*, R. T. S. p 89.

pass to new hunting-grounds. The French call such threads *fils de la Vierge*. Sometimes the gossamer spider secures its thread and then spreads its limbs, and trusts itself to the summer air—the thread lengthening as it goes. Such spiders have been seen to alight on the topmost steeple of York Minster.*

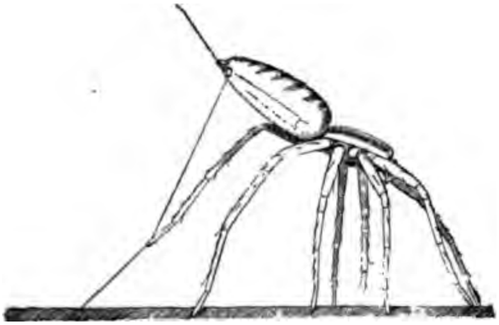

Fig. 56.

But the most remarkable of the weaving spiders is, I think, *Argyroneta aquatica*. This creature forms its web below the surface of the water. It shuns stagnant pools and rapid streams, but frequents deep ditches in which there is a gentle current. First it spreads its stays from one aquatic plant to another till sufficient anchorage is secured. Then from these it raises a closely-woven air and water-tight dome, like the half of an egg-shell. Its next task is to supply this habitation with air, and to expel the water. Its proceedings for this purpose seem almost miraculous. It rises to the surface, throws itself over with a sudden jerk, and entraps, with a film of web guided by its hindmost legs, a globule of air about the size of a buck-shot. With this it scuttles down to its habitation, and dives beneath it. It then sets free its globule of air which rises to the top of the dome, and displaces some of the water. Repeated efforts fully accomplish its work; and the spider has then an elegant, comfortable and secure dwelling-place. In it it lays its eggs, enclosing them in a cocoon or sack. Occasionally it makes an expedition for food, or to renew the air in its habitation. On the approach of winter it becomes torpid, and in this condition it remains till spring. As a boy, in one of the "Home Counties" in England, I often sat by a sluggish stream, and watched these spiders at their work.

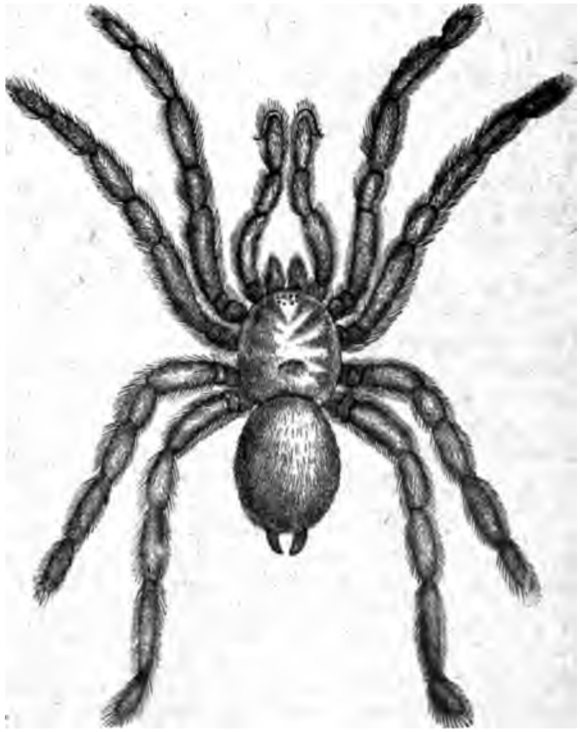

Fig. 57.

The domestic spider (*Clubiona domestica*) is not a pleasant object. Its web is untidy, and its own appearance disgusting, but it intrudes everywhere. It "layeth hold with its hands, and is in kings' palaces."

Among remarkable spiders the Mygales or Bird-spiders hold the first place. Between thirty and forty kinds of them are known. The largest of them have a length of body of two inches and a half, and, when their legs are spread, measure eight inches from claw to claw. *Mygale fasciata* of Ceylon, *Mygale maculata* of South America and *Mygale Blondii* of the West Indies are among the giants. (Fig. 57. Mygale Hentzii of Texas).

Some of the Mygales are known as "Trap-door Spiders" They form tunnels in the earth several inches deep, and beautifully formed. The walls are hard and brown, but are lined with white silk, stiffened and smoothed with a natural cement. The doors of these habitations are wonderfully fitted and hinged, and close with their own weight.

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* Kirby and Spence's Entomology, letter XXIII.

Of the Wolf or Hunting Spiders the "Tarantula," *Lycosa tarantula apuliæ*, is a famous example. It abounds in the neighbourhood of Taranto (the ancient Tarentum) and Naples. In colour it is grey, and it has six angular black patches on the back of its abdomen. It is not a very large spider, being only a little over an inch in length. It hides in holes in the ground and under stones; and the bare-footed Italians are sometimes bitten by it. When a case of this sort occurs, the *fiddler*—not the doctor—is sent for; and the patient is kept dancing until utterly exhausted. After a brief rest he is aroused for another dance. And the exercise is renewed at intervals until the spider virus is supposed to have been eliminated.

There are some long-legged creatures that are commonly known as "Daddy Longlegs" or "Harvest Spiders." They are not true spiders—they belong to the Phalangiidæ. They have two eyes, one on each side of a sort of turret on the head. Their bodies are small and oval, and their eight legs are disproportionately long. They are useful creatures, feeding upon plant-lice and other insects, and, as far as I know, are quite harmless. Our commonest species are *Phalangium cinereum*, the ash-grey harvest spider and *Liobunum vittatum*, the striped harvest spider. Their eggs are laid in the ground, and the young come forth in the spring.

The naturalist who would collect spiders should carry a wide-mouthed bottle containing "*whisky blanc*." Into this he should drop the specimens as he finds them. He could afterwards place them separately in the same liquor, and in bottles of suitable size and form. The name of each specimen identified should be pasted on the bottom of the bottle. For classification the specimens might be placed in small racks—each *family* in a separate rack, and each *genus* in a separate row.

NOTES ON INSECTS OF THE YEAR—DIVISION I., OTTAWA DISTRICT.

By W. Hague Harrington, F.R.S.C., Ottawa.

My time was unfortunately so fully occupied during the season of insect depredations that my observations were very limited, and in consequence my notes are few and brief.

Grains and Grasses.—I did not hear of any insect attacks on wheat; neither was the Grain Aphis (*Siphonophora avenæ*) observed. The grasshoppers also were much less numerous than during the past year or two, possibly due to the unusual continuance of wet weather in midsummer. There was some Silver-top in old hay fields, caused probably by *Thrips poaphagus*, although Prof. Osborne has suggested that a large proportion of the injury known as Silver-top is due to the attacks of certain minute bugs.

Roots and Vegetables.—Cutworms continue to be troublesome, the commonest species being the Red-backed Cutworm (*Carneades ochrogaster* Gn.) The ravages of these very destructive grubs could be greatly lessened by a careful use of the traps mentioned last year and which are strongly recommended by Dr. Fletcher in his valuable reports. Such traps are formed by dipping bundles of weeds, grass or clover in a strong mixture of Paris-green and water, or by slightly damping bran and mixing thoroughly with it a little of the poisonous powder. Turnips did not appear to suffer much from the Striped Flea-beetle (*Phyllotreta striolata*) usually so destructive, nor from aphides, but towards the end of August they were pretty severely attacked by the White Cabbage Butterfly (*Pieris rapæ*) and by the diamond backed moth (*Plutella cruciferarum*). Onion, Cabbage and Radish maggots (*Phorbia*) were not quite as bad as last year, but still inflicted considerable loss. The White Cabbage Butterfly also considerably infested cabbages.

Peas and Clover.—A few peas have been found injured by the Pea Weev (*Bruchus pisi*) but the insect is very rare in this district which is outside its usual limits

A new pest has been observed upon Sweetpeas in gardens, viz. the Pea Aphis (*Nectarophora destructor*) which was very bad on some hedges of sweetpeas late in the season. Owing to the wet season in July injury by red spider was only complained of in a few places. Some damage was done by the Green Clover Weevil (*Phytonomus nigrirostris*) a serious attack having been noticed in the experimental plots at the Central Experimental Farm. The Black Armyworm (*Noctua fennica*) attacked both peas and clover, and was also troublesome in gardens.

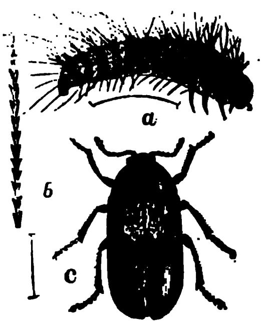

Fig. 58. Dermestes lardarius. A., larva; B., hair of do. magnified greatly; c., beetle.

FRUIT.—The Currant Aphis (*Myzus ribis*) was rather abundant, but was largely destroyed by the larvæ of various lady-birds (*Coccinellidae*)—The Currant Sawfly (*Nematus ribesii*) also continues to greatly defoliate currant and gooseberry bushes whenever prompt measures are not taken to destroy the broods. The last brood of the Cherry Slug (*Eriocampa cerasi*) was very abundant upon both plums and berries. The Oyster-shell Bark-louse (*Myrtilaspis pomorum*) has been bad in neglected orchards, but such places are naturally breeding grounds for many pests.

FOREST SHADE TREES.—The Tent Caterpillars (*Clisiocampa*) were again enormously destructive, and large areas were completely stripped, and the woods were rendered very unsightly and uninviting by the quantities of webs and larvæ. Parasites, however, seem to be increasing, and many caterpillars also died from a fungous or bacterial disease.

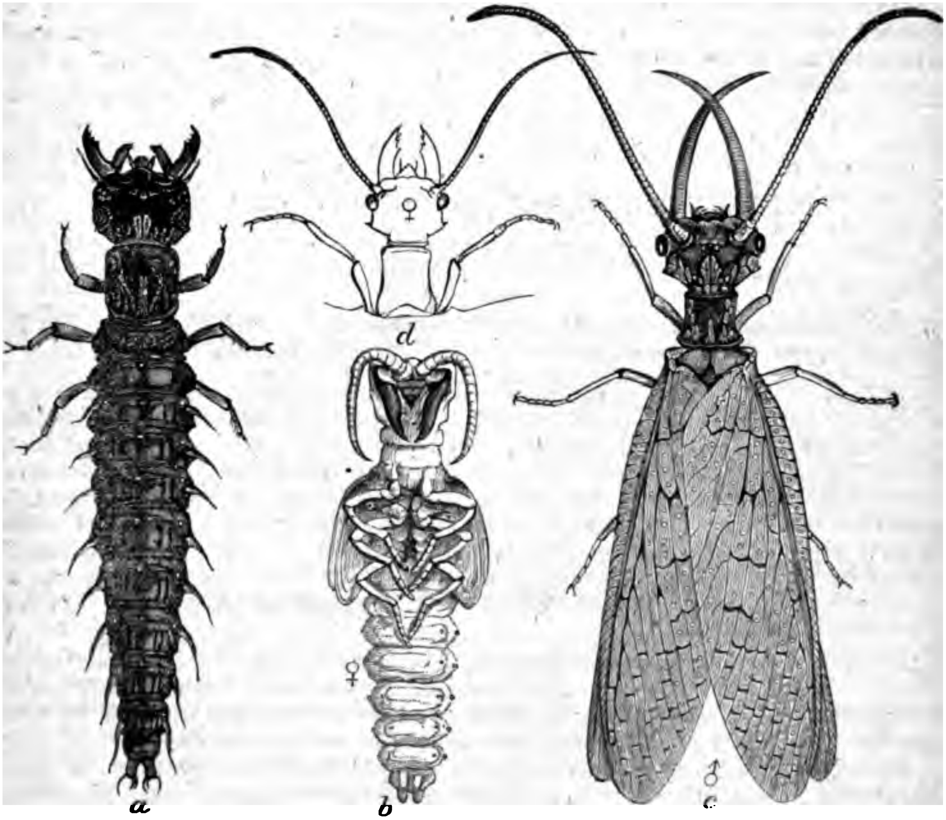

FIG. 59. Corydalis cornutus: A., larva; B., pupa; C., male; D., head and jaws of female.

The moths seemed less abundant around the electric lights, but in the woods there are now to be found many fresh egg-masses, so that the plague promises to continue next spring. The Yellow-necked Caterpillar (*Datana ministra*) did some damage to birches and was occasionally seen on elms. *Vanessa antiopa*, which is frequently a serious pest on our ornamental elms, seemed this year to confine itself to the willows. Elms, however, suffered very much from the attacks of plant lice, which were so numerous that the trees dripped moisture to such an extent that the sidewalks beneath them were kept quite wet for several weeks. The White Cedar Lecanium (*Lecanium Fletcheri*) was abundant upon some Arbor-vitae trees, but was severely attacked by the parasites which Dr. Howard bred from specimens which were sent to him some years ago from the Experimental Farm. *Nematus Erichsonii*, the Larch Sawfly, seemed to be more abundant there last year, although by no means in such numbers as it was several years ago, when its ravages resulted in the destruction of the greater part of our larches. The Spruce Kermes (*K. abietis*) has become more abundant and does serious damage, but the Spruce Sawfly (*Lophyrus abietis*) seemed less numerous. Canker Worms were little in evidence.

MISCELLANEOUS.—There was a remarkable abundance everywhere of *Dermestes lardarius* (Fig 58) and some houses were so infested that the beetles were a veritable plague After the July rains mosquitoes made their appearance all through the city in great numbers and were especially troublesome in the sections where lawns and gardens are most numerous. Many of the residents on such streets kept smudges burning every evening during the period of the abundance of these irritating flies. Kissing-bugs of various orders were brought in for identification, generally on the principle that the bigger the insect the more likely it was to be dangerous; the favorite competitor seeming to be the male of *Corydalis cornutus*, (Fig. 59).

NOTES ON THE SEASON OF 1899, DIVISION NO. 2.

BY J. D. EVANS, TRENTON, ONT.

Owing to pressure of duties the writer's opportunities during the past season for observing the presence of destructive insects were extremely limited.

One insect (*Clisiocampa sylvatica*) was, however, so numerous and destructive to the foliage of forest trees that the most unobservant person could hardly avoid noticing the destruction going on. From Trenton northerly to Bannockburn, a distance of about 46 miles, but more especially from Chisholm's Rapids northerly to the same point some 33 miles, the depredations were most severe. In many places the trees were nearly defoliated, but in some sections, blocks of woods were left without a vestige of a leaf. This caterpillar did not confine itself to forest trees, for orchards in the vicinity, although separated by many rods of cultivated land, were badly attacked, and one case can be recalled in the Township of Rawdon where an orchard consisting of from 100 to 200 trees was completely defoliated.

The caterpillars were in such immense numbers that on the 1st day of June, on the railway track, at a point about two miles north of Marmora station, the passenger train became stalled, and it was necessary to sweep the rails and use sand to enable the train to proceed. Three-quarters of an hour was consumed in making 300 yards.

The defoliated trees, releaved later in the season with diminutive leaves, in many cases however with large trees only the lower limbs showed signs of life. In sections where the insects had been prevalent in former years it was noticed that the tops of large trees were generally dead.

The Tent Caterpillars (*C. Americana*) were prevalent in neglected orchards; they were also observed to attack the mountain ash, their nests being seen on the trees.

NOTES ON INSECTS OF THE YEAR—DIVISION No. 3, TORONTO DISTRICT.

By Arthur Gibson, Assistant Entomologist, Central Experimental Farm, Ottawa.

Toronto and its vicinity have not, so far as I have been able to learn, suffered very seriously from the attacks of injurious insects during the past year.

The Tussock Moth (*Orgyia leucostigma*) caused some damage to shade trees, mostly horse chestnut, along many of the streets in Toronto during the past summer, but was not nearly so abundant as in the previous few years. One locality especially, however, suffered seriously, namely, the St. James's Cathedral property. The horse chestnut trees around the Cathedral were attacked and the foliage entirely destroyed in some cases. In 1896, the year Toronto was visited to such an alarming extent by this pest, many of these trees, were perfectly stripped of leaves. The Toronto civic authorities ever since 1896 have been painting the shade tree on a large number of streets, with a mixture, which I think is called "Caterpillarine," but this apparently has not been much of a protection. No doubt many of these caterpillars which had fallen to the ground were prevented by this sticky substance from climbing up the trees, but of course, it did not have any effect on the great majority which were up in the trees and which were doing the damage. I think if the civic authorities had taken this matter up at the proper time and sprayed the trees sufficiently, before the caterpillars got too large, with one of the standard arsenical mixtures, such as Paris green, or arsenate of lead, much of the foliage would have been saved, and the pest to a much greater extent stamped out. Much good work, however, was done by the destruction of large numbers of egg masses, which were collected from the trees by school boys and others, at a small outlay by the City Council.

The Tent Caterpillars, as in many parts of Canada, caused considerable damage to forest and fruit trees in the vicinity of Toronto. In early spring I noticed dozens and dozens of "tents" on wild cherry trees close to the Humber River. Many of the fruit trees in neighboring farms were also badly infected.

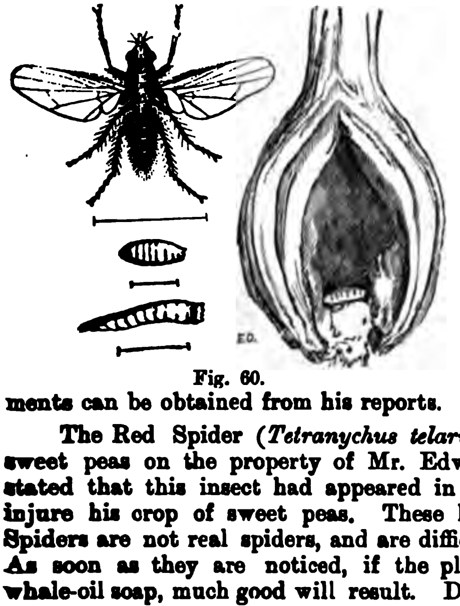

Fig. 60.

The Onion Maggot (*Phorbia ceparum*) Fig. 60, was troublesome in certain market gardens. Mr. Crew, in a conversation, mentioned that a friend of his has had good success in fighting this insect by the use of alum diluted in water, and sprinkled along the rows of onions with an ordinary watering can. All of these root maggots are difficult to treat, some experimenters obtaining results with certain materials, which in the hands of others appear to have been of little value. The most successful experiments recorded in Canada, mentioned in the Reports of the Dominion Entomologist, have been with carbolic acid, in some of its various forms, and white hellebore. Full details of these experiments can be obtained from his reports.

The Red Spider (*Tetranychus telarius*) Fig. 61, was reported as doing damage to sweet peas on the property of Mr. Edward Leadley, of Robert Street, Toronto, who stated that this insect had appeared in sufficient numbers during the past summer to injure his crop of sweet peas. These little creatures although commonly called Red Spiders are not real spiders, and are difficult to treat when they become once established. As soon as they are noticed, if the plants are sprayed with kerosene emulsion, or whale-oil soap, much good will result. Dusting with sulphur is also very useful. Sweet peas in Toronto were also attacked by the Destructive Pea Louse (*Nectarophora destructor*) which has done so much harm this year in Canada, particularly in New Brunswick and Ontario. Mr. Leadley writes that it was extremely injurious on his sweet peas. In other places it has not only attacked this favorite flower but also done injury to field peas.

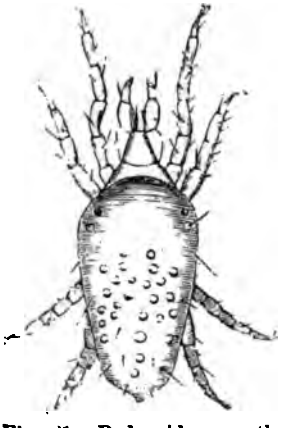

Fig. 61.—Red spider, greatly magnified.

In Parkdale, Toronto, many of the residents complain of the prevalence of fleas in their houses during the past summer. About the first week in September these little pests were extremely abundant, much to the writer's regret, as he spent a night at a friend's house, while he was visiting Toronto. These may have been introduced into the houses at first, no doubt, through the agency of some pet animal, and had probably multiplied during the summer absence of some of the residents. The young larvae feed upon animal matter in dust, and being very slender and active, penetrate into the smallest of cracks in floors, walls, etc., and where dust has accumulated will breed rapidly. Thorough cleanliness therefore, and a frequent use of scalding water, will do much to remedy the occurrence of this pest.

Another insect which has caused some anxiety in Toronto during the past season is a black aphis attacking violets (*Rhopalosiphum violae* n. sp. Perg.). Mr. J. H. Dunlop, the well-known florist, has noticed the occurrence of this pest in his green houses among his violet beds. On the 13th October, when in Toronto, I visited Mr. Dunlop's houses and found this aphis very abundant, but fortunately it has not done much damage as yet in this country. Last year Mr. Dunlop's violets suffered from an attack of *Emphytus Canadensis*, the Pansy Sawfly, but this year he has not been troubled with this insect. A small pyralid moth (*Phlyctaenia ferrugalis*) appeared among Mr. Dunlop's rose bushes the past year, and its larvae occurred in sufficient numbers to cause some damage to the foliage of these plants. When full grown the larva is about ¾ of an inch in length, and is a semi-translucent green with a dark green dorsal stripe, on each side of which is a sub-dorsal white band. Those which were found by the writer, when in Mr. Dunlop's houses, were feeding on the underside of the leaf, which had been drawn together somewhat by means of a slight web, the injury seemingly being chiefly done by eating the soft tissue on the lower side of the leaves.

NOTES ON THE SEASON OF 1899.

By J. Alston Moffat, London.

From various causes, personal observations on the doings of insects during the past season, were with me decidedly limited; so I was dependent in large measure upon the observations of others for my knowledge of what was going on in the insect world.

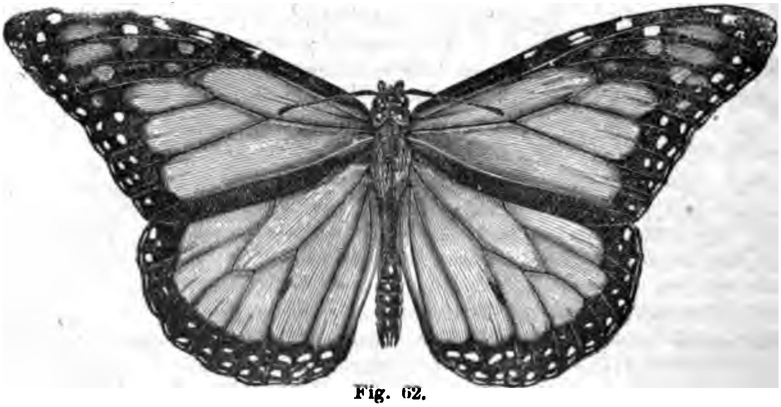

Fig. 62.

The Colorado potato beetle, *C. decemlineata*, was very late in putting in an appearance; so much so that many thought that the severe frosts of the previous winter on the bare ground had finished its career, but later on Paris Green was in demand all the same. The imported cabbage butterfly, *Pieris rapæ* was to be seen in abundance, especially during the latter part of the season. The moth of the climbing cutworm, *Hadena arctica* which was such an unwelcome intruder in houses in the season of 1895, was again in evidence, but in moderate numbers.

The superabundance of the Milkweed butterfly, *Anosia archippus*, (Fig 62) attracted general attention, even amongst those who are not in the habit of noticing butterflies. It appeared early, and kept increasing in numbers until about the end of August; whilst specimens of it were taken as late as the middle of October. One of our members who lives in the country, a short distance from the city, told me that he was out in a field one evening when he saw them in great numbers hanging to the heads of grain, and that he picked off several dozens of them with his fingers. Another of our members informed me about the end of August, that he had been in a wood to the North-East of the City with his dog, which started them up by the hundreds from bushes where they had settled down for the night; and he thought it something very strange, but I had no difficulty in showing him from books that it was a well-known habit of theirs. And yet this gathering in flocks at a particular place to pass the night together like birds, long before their time for migrating has come, is indeed a singular disposition for butterflies to display. (Fig. 63.) During daytime they care nothing whatever for each other's company, but fly aimlessly about as solitary individuals, as if they were in a meditative mood. When, with night's approach they begin to congregate at their rendezvous, then they cannot get close enough to each other; but will crowd themselves in where there is no room, to the great inconvenience of those already there, and so cause much commotion in the flock before they finally settle down for their night's repose. *Anosia Archippus* appears to be an Entomological Enigma.

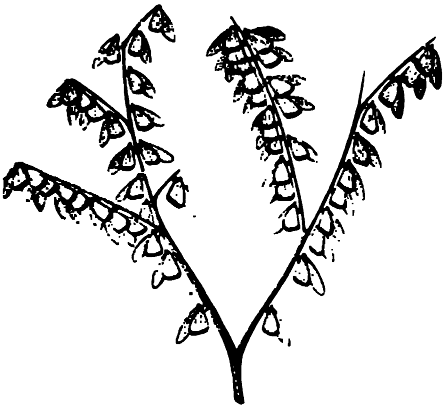

Fig. 63.

Reports of the butterflies appearing in vast numbers have been received from various localities, and newspapers have reported swarms of them as filling the air, but no intimation was given as to whence they came or whither they were going; indeed, the observers probably did not know that it was of any importance as to where they were going, or if they were going anywhere at all in particular, and so missed an opportunity of adding to our knowledge in this matter.

This has been a favorable season for making observations, as they were moving in masses that could be easily watched, and a definite idea obtained of their rate of travel and the direction taken by them. But this is a kind of work that a central bureau of entomological information can alone accomplish satisfactorily. Notice could have been sent in of their having left the north, and warnings issued to every observer to be on the lookout for them on their way south, and thus a connected account obtained of their movements from start to finish.

Mr. Bird's paper in the *Canadian Entomologist*, vol. 30, page 126, giving his method of securing the larva and pupa of a variety of species of the genus *Hydræcia* in their different food plants, and thus obtaining the moths in a perfectly fresh condition, which is of such advantage for the correct separation of the species in this genus, created much interest amongst collectors, and an effort was made here to follow out his directions, which resulted in a good measure of success. Mr. Bice secured in large numbers *H. cataphracta*, *H. nitela* and its variety *Nebris*, from Burdock, Giant Ragweed, Elder and Wild Parsnip. Mr. Balkwill collected in Burdock principally, from which was obtained a fine series of *Cataphracta*, with an interesting amount of variation in the depth of coloring, and in the conspicuousness of their ornamentation, which was gratifying to secure. Thus, although the hunts produced nothing new, they gave encouragement to the hope that with the knowledge acquired, better results may follow renewed efforts next season. There are species of *Hydræcia* taken here whose food plants are not yet known, and a knowledge of which is of sufficient importance to warrant an expenditure of time and labor in an effort to try and discover them. But, as Mr. Bird has remarked, more species may be found in that way whose presence was never seen or suspected in that locality.

During the past five or six years the ornamental Birch trees of this city have been showing signs of being affected by some disease; indeed, several large and much valued trees have died outright during that time. The preliminary symptoms are a weakening of the growth, and a thinning of the leaves at the apex of the tree, which gradually spreads downwards until the whole tree is affected and gives up its life. I have thought that it might result from the work of borers, and I have taken *Clytanthus ruricola* and *Agrilus bilineatus* on the trees, and have seen many holes in the trees out of which such beetles might have come,—with Woodpeckers' work conspicuous and abundant. And yet, if they are to blame, it does appear strange that the trees should be affected in that particular way; unless the borers are more numerous at the top than they are at the base of the tree.

A few important additions have been made during the past season to the Society's collection of native lepidoptera; amongst them are the following:

Orthosia helva, Grote. A species which I have had the impression for many years should be classed as Canadian, but could get no authentic record of its capture in Canada, until last summer, when Mr. H. S. Saunders of London took it at Ottawa, and presented a specimen to the Society.

Aglossa cuprealis, Hub. Taken at light by Mr. Bice.

Hydræcia furcata, Smith. This was a capture made by Mr. C. G. Anderson several years ago. I regarded it as a badly faded specimen of some common form; but when seen by Dr. J. B. Smith, he informed me that the color was normal, and that it was really a very good species.

Hydræcia stramentosa, Guenee. This is a species that has been regarded by Canadian collectors for the past thirty years as belonging to our fauna, and was placed in our label list as such; but all inquiries on my part failed to elicit any information concerning it, until I began to suspect that there had been a mistake made somewhere. Recently, whilst engaged in naming some material for Mr. Dwight Brainerd, of Montreal, a difference of opinion arose between us about the correct name of a *Hydræcia*, which was settled by Dr. J. B. Smith in his favor. Then Mr. Brainerd sent me a second specimen of the disputed form, and with it another *Hydræcia*, which he said he took at Montreal in numbers every season, and which was known to them as *Stramentosa*. And there, sure enough, was the long lost and much desired species, which had been kept out of sight, and from public knowledge through all these many years. This I regarded as the prize of the season.

NOTES ON THE SEASON OF 1899.

By Rev. C. J. S. Bethune, London, Ont.

The writer's opportunities of collecting and observing insects have been very limited this year owing to his removal from Port Hope to London in the middle of the summer. No one, however, could fail to observe the enormous abundance of Tent Caterpillars (*Clisiocampa*) and the amount of damage inflicted by them on the foliage of fruit and forest trees. From every part of the Province they were reported to be similarly abundant, though in many places much more destructive than in others. In the neighbourhood of Port Hope the "Forest" species (C. *disstria*) was not particularly noticeable and did not cause any injury worth mentioning; but the "Apple tree" species (C. *Americana*) was very abundant and destructive to foliage of fruit trees in gardens and orchards, especially where no attempt was made to get rid of them.. In the winter the egg-bracelets may be cut off and destroyed, and in early spring the tents, or webs, can easily be seen in the forks of small branches when the tender leaves are expanding and can be removed without much difficulty. By adopting these means, the writer cleared his garden almost completely, a few stray caterpillars only escaping destruction.

The only other general outbreak of the year was that of various species of Aphides (plant lice), which have been swarming in myriads for several seasons now and attacking a large number of cultivated plants. The long continued drouth in the summer, combined with some very hot weather, reduced their number considerably and caused them to be much less troublesome in the autumn. During the two preceding seasons in October and November the air on sunny days was filled with infinite numbers of the winged specimens to the great annoyance of everyone out of doors, but this year, though numerous enough, they did not cause the same amount of discomfort and we may infer that they are not likely to be so abundant and destructive next year.

Every gardener and fruit grower has some insect or other to complain of; our familiar enemies are always at work, cut-worms, caterpillars, potato-beetles, codling worms, grasshoppers, curculios, slugs, sawflies, flea-beetles, and hosts besides, but there has been no one kind in more than ordinary abundance or requiring more vigilant measures for prevention than usual.

Among other insects—those that do no injury to cultivated plants—may be mentioned the handsome Archippus butterfly. Last year it was unusually scarce, but this year it swarmed all over the country, in cities and towns as well as in the rural districts. Even the most indifferent could not fail to be struck with the great numbers of these beautiful creatures which float so majestically in the summer air. Their curious practice of assembling in large numbers in the evening and roosting together was noticed by many observers. Night after night the writer observed them flying singly in rapid succession up the hill on which his garden stood, and, after a little soaring about, gathering together on the dead branches of some trees close to the house. Here they would huddle together in great numbers till the bough looked as if clothed with brown leaves of a triangular shape. If disturbed they would flutter about for a few minutes and then settle down again on the same or a neighboring twig. The late arrivals usually caused much commotion by trying to force their way in where there was no room for them. This singular proceeding lasted for many nights and was watched with great interest. When darkness came on they could easily be picked off with one's fingers without causing any alarm amongst those close by. In the early morning they were all off again on their individual duties or pleasures, and showed no desire for the companionship of others till the fading light of day caused them to look for a sleeping-place. The phenomenon is a singular one and not easily to be explained.

Another handsome butterfly, *Papilio Marcellus*, was seen again at Port Hope this summer. As this makes the fourth year of its appearance in the same locality, we may infer that it has succeeded in making a permanent residence there, though in very limited numbers at present.

In August last, the Editor of the "*Mattawa Tribune*" sent to the writer for identification, a caterpillar, which changed to a chrysalis before it arrived at its destination. It proved to be the Tiger Swallowtail (*Papilio Turnus*). About the middle of November, there emerged from the chrysalis, which had been kept in a warm room, instead of the expected butterfly, a large ichneumon fly, *Trogus fulvipes*, Cresson. This is rather a rare species, our common parasite of the Papilios being *Trogus exesorius*, Brulle, and is reported from the Province of Quebec, Maine and New Hampshire. It is almost entirely black with smoky wings, the lip, knees, tibia and tarsi being yellow.

The locust trees in and about Port Hope have been for some years severely attacked by the grubs of the well-known boring beetle, *Cyllene robiniæ*, and a large proportion of the smaller trees have been killed by them. In the case of older trees, branches and limbs are so much perforated that they break off when violent storms occur, but the tree itself does not usually succumb. Another enemy is now, however, at work boring into the solid wood, and it is not likely that even the largest trees will long be able to withstand these combined attacks; this is called the locust tree carpenter-moth (*Prionoxystus robiniæ* Peck). The larva, when full grown, is between two and three inches in length and nearly half an inch in diameter; its borings through the solid wood are consequently very large and cause much injury to the trees. Fortunately the timber is of no commercial value, the trees being grown for shade or ornamental purposes, and being attractive chiefly from the fragrance of the blossoms and the ease and rapidity with which they can be grown. The moths of this species are very singular in appearance; the females are of a grey colour, similiar to the bark of a locust tree, the fore-wings being closely covered with a net work of black lines and having also some irregular black spots; the hind wings are of a uniform dusky color; the wings expand about three inches. The male moths are much smaller, expanding only about two inches, darker in colour and distinguished by a large bright yellow patch on the hind wings. They are so unlike the other sex that they might easily be taken for a different species. The females come into houses attracted by light in June, but the males are rarely seen.

The squash bug (*Anasa tristis*) fig. 23 has been very abundant this year on the squash plants, great colonies of larvae in all stages of growth being found; these are of an ashen grey colour with pink antennae. When they have reached this stage in their career, it is not easy to find a remedy; in the case of a few plants in a garden hand picking may be resorted to, that is they can be brushed off into a shallow tin dish and then destroyed. But where they are grown on a large scale for marketing, kerosene emulsion might be applied but would involve a good deal of trouble as the bugs are concealed and somewhat protected by the leaves towards the base of the plant. As the insect passes the winter in the full grown state, many may be destroyed in the autumn when they are wandering about in search of shelter; and in the early summer, when they come out to lay their eggs, they may be trapped by placing chips or small pieces of board close to the young plants; under these they will hide in the day time, and may then be readily captured and destroyed.

An interesting capture in London was made by Mr. Short, one of the city postmen. On September 26th, when going his rounds he found a perfect specimen of the large and handsome sphinx moth, *Phlegethontius cingulatus*, which is distinguished by the series of rose-red spots on each side of its abdomen.

NOTES ON THE SEASON OF 1899.

By Rev. T. W. Fyles, Levis, Quebec.

The season of 1899 was, at Quebec, a strangely variable one. The thermometer under my verandah recorded 93° in the shade on July 25th, and 43° in the shade on October 2nd—a difference of 50°. On the latter date there was a slight flurry of snow.

The weather was dry when rain was needed, and wet when fine weather would have been welcome. So dry was it, for a time, that the leaves of some exposed trees withered and fell untimely, without having taken the autumn tints. For the same reason the potatoes on the high land have been found to be small and few to the hill.

Insect Pests.

Early in the season the tent-weaving caterpillars of *Clisiocampa Americana* Harris and *C. disstria*, Hbn. were exceedingly numerous and troublesome. On the railway, in parts of the eastern townships, their crushed multitudes are said to have made the rails slippery, and retarded the progress of the trains.

On the Island of Orleans, early in June, the larvæ of *Hybernia tiliaria*, Harris, defoliated many young trees. (Fig. 64.)

BUTTERFLIES.

In June *Papilio Turnus* Linn, and *Danais Archippus*, Fab., were unusually abundant. On the 25th of the month I found Archippus larvæ in the second and third stages. At the same time the female butterflies were hovering about the milkweed in numbers, laying their eggs one here and one there on the plant. The more advanced larvæ were full fed on the 4th of July, and suspended themselves for the pupal change. A day later they cast the last caterpillar skin, working it upwards till it reached the cremaster, when a succession of convulsive twists dislodged it, and it fell to the ground. The abdominal segments were then drawn up and shaped into the rounded summit of the very beautiful pupa. The pupa changed from green to a rich mahogany brown in the night of July 16th-17th, and the perfect insects appeared in the afternoon of the 17th. Butterflies of this species were on the wing throughout the month of August

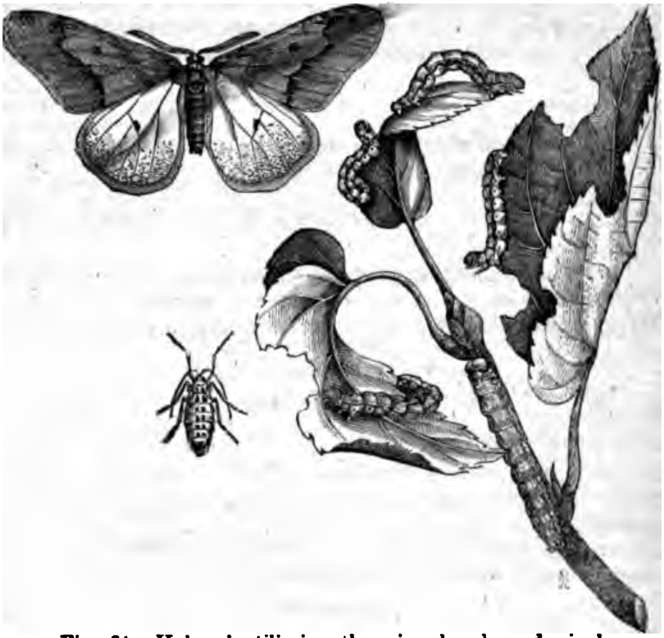

Fig. 64.—Hybernia tiliaria: the winged male and wingless female moths; larvæ of various sizes.

In July *Chrysophanus epixanthe*, Bd., and Lec.. was unusually abundant at the Gomin Swamp.

In August larvæ of *Grapta interrogationis*, Fab., were found feeding upon hops which shaded the verandah of the country residence of the Hon. Richard Turner, on the Island of Orleans.

In this month I saw *Pamphila Manitoba*, Scud, on the Heights of Levis, but not in numbers.

SAW-FLIES.

In the Society's Annual Report for 1897, on page 73, I gave an account of the saw-fly larvæ that fed on poplar, and a description of the perfect insect. Mr. Ashmead has since identified this for me as *Nematus luteotergum*, Norton.

On the same page I described saw fly larvæ that fed on *Cornus*. They buried themselves in October, and I found some of the larvæ quite fresh in the Spring, but they failed to pupate, and perished. Last fall I obtained a new batch of the larvæ and placed in the cage with them some pieces of decayed birch-wood. On the 15th of September, immediately after a moult, they proceeded to tunnel into the wood. All had disappeared before the 24th of the month. It was amusing to see how expeditiously and neatly the creatures accomplished their task. Every larva cleared its way with a whisk of the after part of its body, which scattered the *frass* in a regular circle of about the diameter of a half dollar. The finished hibernaculum was a clean swept, oval chamber, just large enough to hold the larva comfortably. In this the creature remained unchanged till the middle of June. On the 20th of June I saw the skin of one specimen burst at the head and reveal the pupa. The insect in the pupal stage was seven and a half lines in length, waxen in appearance. The head was distinct, and the eyes showed through the skin as reddish-brown spots. The antennæ and legs were free. Imagos of the species appeared in the last week of June and the first week of July. They proved to be *Harpiphorus tarsatus*, Say.

In the beginning of July, in examining a discolored larva of the species, I made a small opening in the head and suddenly a very active specimen of *Hemiteles mucronatus*, Prov., burst forth. Individuals of this species had previously shown themselves in the cage.

A PARASITE OF HYLOTOMA PECTORALIS, SAY.

In the beginning of the season I obtained a specimen of *Pimpla inquisitor*, Say, from a pupa of *Hylotoma pectoralis*, Say.

DATES OF APPEARANCE OF CERTAIN INSECTS.

My insect breeding cage was placed out of doors, and was buried under the snow during the winter. It was not taken in till the spring opened. The following then may be regarded as indicating the natural times of appearance of the species mentioned.

Papilio Turnus, Linn, appeared May 28th.
Papilio brevicauda, Saund, appeared May 23rd.
Sphinx Kalmiæ, A. & S., appeared May 25th.
Sphinx luscitiosa, Clem., appeared May 27th.
Paonias excæcatus, A & S., appeared May 27th.
Edema albifrons, A & S., appeared May 27th.
Cerura borealis, Boisd. appeared June 3rd.
Cerura scolopendrina, Bdv. appeared June 6th.

SPHINX LUSCITIOSA, CLEM.

On the 27th of May two beautiful specimens of this moth appeared in my insect cage. The larva of the species feeds on *Populus tremuloides*. It is long in proportion to its girth. It is apple green in colour and has seven side lines. Each line is white below and mauve darkening to purple above. The last line is extended to the end of the horn which is green and rather short. On the body are numerous minute rings with white centres. These are most numerous on the 3rd, and 4th, segments, and along the sides. The head is green, and has a yellowish-white line down either side, supported by a dark purplish line outwardly. The cheeks beyond the lines are spotted with white. The true legs are whitish and tipt with brown. The larvæ were full fed on the first of September, and buried themselves in the soil.

INTRUDERS.

Periplaneta Australasiæ.

In the beginning of June, a fine specimen of the Australian Cockroach (*Periplaneta Australasiæ*) was found in a bunch of bananas by Oswald Davie, a junior member of the Quebec branch of our society.

Tenebrioides Mauritanicus Linn.

In the middle of April, I discovered a number of "Cadelle" larva in some Graham flour obtained from a store in Levis. This is a description of them :

Larva 7 lines in length, greyish white in color, somewhat flattened in appearance, has white hairs thinly scattered over its body. The abdominal segments are larger than the thoracic. The head is brown and shining, as is also the plate on the second segment. The last segment has a peculiar dark brown forked termination. The legs are wide-spread, amber in colour. When near pupation the larvæ managed to escape.

A Busy Scene.

On the 14th of June I found a thorn-tree (*Cratægus crus-galli*, L.) in full blossom. Growing on the north-west slope of a cliff, it was later in flowering than other trees of its sort. I was surprised to see the multitude of insects that thronged it. In the few minutes that I stood by, I noticed many specimens of the undermentioned kinds:—

Butterflies—*Papilio Turnus*, Linn; *Lycæna Couperi*, Grote.

Beetles—*Clytanthus ruricola*; *Anatis 15-punctata*, Oliv.; *Cyrtophorus verrucosus*, Oliv.; *Leptura lineola*, Say; *Donacia emarginata*, Kirby.

Two-winged Flies—A species of *Chionomus*; *Pangonia tranquilla O. S.*; *Stratiomyia obesa*, Loew; *Milesia excentrica*, Harris; *Syrphus xanthostomus*, Wied; *Sericomyia militans*, Walker, *Sphærophoria Cylindrica*, Say; *Musca Cæsar*, Linné.

Bees—*Apis mellifica*, Drury; *Andrena nivalis*, Smith; *Osmia bucconis*, Say.

Wasp—*Vespa maculata*, Fab.

Saw-flies—*Tenthredo lineata*, Prov.; *Monophadnus scelestus*, Cr.

Metzneria Lappella, Linn.

In the beginning of September, 1898, I discovered, in the heads of Burdock, a curious larva, of which the following is a description:

Head bi-lobed, brown; mouth organs large. A brown plate, marked longitudinally by a white line, on the second segment. Body rounded, much crinkled, of a fatty appearance, having a few white hairs along the sides. Anal segment small and protruding. The legs small and weak. The pro-legs seemingly atrophied into mere pseudopodia. Length of larva two and a half lines.

On the approach of winter, the larva having eaten out a convenient hollow in the closely packed seeds, cemented its surroundings together, and then lined its cell with a flocculent white cocoon. In this it remained unchanged till the beginning of June when it went into chrysalis.

The pupa was of elegant shape, amber-coloured—the head parts darkening into brown. The antennæ and legs were traceable through the skin. The length of the pupa was three lines. The moths appeared in the end of June and continued till August. They mated about the middle of July.

The dimensions of the perfect insects were as follows:

Expanse of wings (male) 5½ lines, (female) 9 lines.

Length of body (male) 2½ lines, (female) 4 lines.

Length of antennæ (male) 2 lines, (female) 3 lines.

The eyes of the moth were large and prominent, in color they were a rich, warm brown. The palpi were reflexed—the second joint was long and had long scales, and the terminal joint was pointed. The antennæ were filiform, prettily encircled with minute, short bristles at the joints. The proboscis was long and coiled up, watch-spring fashion. The body terminated with a tuft like a paint brush. The tibia in the hindmost pair of legs had two pairs of spurs—that in the second pair, had but one pair of spurs.

The fore-wings were of a pale sienna brown, with a patch of darker brown extending along the costa and towards the inner margin, for two-thirds of the length of the wing. There were three or four lines of darker scales towards the hind margin and following its curve. Some of the specimens had the three dots on the disk spoken of by Stainton (*Man. of Bh. Butt. and Moths*, vol. II, p. 348.) The hind wings were slate-coloured and had long fringes of the same hue.

The eggs of the moth (obtained by pressure) were very minute, globular, smooth and white. They are dropped probably into the flower-head of the plant, for the most careful microscopical examination shewed no opening made by a larva through the glochidate involucre.

On August the 4th, I found the newly hatched larva biting into the side of one of the outer seeds. The seeds at this time were white and tender. The body of the larva was white, waxen, and semi-translucent.

The insects were identified for me by Lord Walsingham and Mr. J. H. Durrant. To them also I am indebted for the correction of the generic name from *Parasia* to *Metzneria*, Zeller.

It may well be asked, How was this European insect advanced to Canada? This probably is the correct answer: At Point Levi there is a quarantine station for cattle; and old country hay and straw are often landed with the cattle; and burs containing larva of the species have, at some time, been landed with the fodder. The Burdock is plentiful on all our roads.

THE "KISSING BUG."

One of the strange occurrences that marked the season was the spread of the "newspaper scare" of the so-called "Kissing Bug." The rumour concerning this fabulous insect took its rise in the United States, and was echoed by our Canadian press. All over the country alarming reports were published till the women were afraid to open their bedroom windows lest the bug should gain admittance. At the time that the fever was at its height, an employee of the G. T. R. company residing at South Quebec, took his family for a trip to the Island of Orleans. The day was hot and the man lay down in the shade for a nap. While he slept something bit him—probably a mosquito or a cattle fly. In his efforts to allay the irritation occasioned by the bite, he enlarged the wound. A day or two afterwards his arm began to swell, and he became seriously ill. Herein was confirmation of the kissing-bug reports! The part of the story that was not generally known was, that the day after he was bitten the man assisted in unloading a car full of raw hides for the tanners, and that it was the corrupting animal matter from the hides that had poisoned the wound.

About this time I came upon a group of excited people at a street corner in Quebec. I looked over the shoulders of the crowd and saw a negro who was exhibiting a very fine specimen of *Sphinx Chersis* as the veritable bug. "And this," said he, drawing out its proboscis with a tooth-pick, "is the instrument that it kisses with." A shudder passed through his auditors as they thought of the deadly effects of a thrust from this long osculatory weapon into the soft cheek of Sleeping Beauty.

INJURIOUS INSECTS IN ONTARIO DURING 1899.

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST, OTTAWA.

A few different kinds of injurious insects have attracted more than usual notice during the past season from the farmers and fruit-growers of the province. The keen interest which has been taken in the spread of the San Jose Scale has been at least enough to satisfy even Entomologists, who have been for three years begging fruit growers to believe that the San Jose Scale is not as was claimed, "only an ordinary insect like the Colorado potato beetle and many others." Unfortunately this conviction may have come too late, and the very men who ought to have been seconding the wise efforts of the Government to conquer this enemy by adopting promptly the measures recommended which would have prevented its spreading, are now claiming that the infestation is so widespread that there is no chance of eradicating it and that therefore the Government must stop all extreme measures. This matter has been discussed at length on previous pages of this report so that it is unnecessary to say here more than that the San Jose Scale is still to be considered one of the very worst enemies that the fruit grower has ever had to fight against, that there is no cheap and easy method of controlling it and that fruit growers should make every effort to get suspicious scale insects found on their trees identified, and if these prove to be the San Jose Scale, do everything in their power to destroy them promptly.

CEREALS.

Grain crops throughout the province have not been injured to any large extent by insects. The Wheat Jointworm, which last year did some damage, has not re-occurred, and the same satisfactory report may be made with regard to the outbreak of the Wheat Midge, which appeared last year along the shore of Lake Ontario in the Niagara peninsula. The Hessian Fly, that old time enemy of the wheat grower, was rather more abundant than usual in Western Ontario, and letters were received asking as to the best way of preventing loss. Wireworms were troublesome in several places, and some practical treatment to prevent loss by these insects is much needed.

The Pea Weevil has done much harm this year. Farmers and pea growers are careless about getting their seed fumigated, and there are many complaints that this serious pest is increasing. In our last report, at page 78, full instructions were given as to the easiest and best means of treating seed pease to destroy the weevils. They were briefly[1] (1) fumigating the seed with bisulphide of carbon, or (2) the holding over of seed for a year.

The Destructive Pea Aphis (*Nectarophora destructor*, Jnsn.).—By far the most serious attack upon field and garden peas during the past summer was by a previously undescribed species of plant-louse. It is very remarkable that a species should suddenly appear, as this one did, in sufficient numbers to destroy millions of dollars worth of produce in a few days, and that it should have been previously so rare as to have entirely escaped detection and description by Entomologists. Such, however, was the case. The Destructive Pea Aphis occurred in vast numbers in several parts of Canada and the United States. Specimens of the insect and reports of its ravages were received from widely separated places, in a line extending from the Maritime Provinces to the Lake Erie counties of western Ontario, and from the Great Lakes down to the Southern States. The species has been worked up and described by Prof. W. G. Johnson, of College Park, Md., and an interesting account of it by him was read at the eleventh annual meeting of the Association of Economic Entomologists last August which will appear in the report of that meeting. Prof. Johnson said "the growing of peas in Maryland is a very important industry, and reliable conservative authorities place the loss this season at $3,000,000. the principal cause being the Pea Louse. In many cases the destruction was complete, varying from mere garden patches to hundreds of acres." The States in which most injury has been recorded are Maryland, Virginia, North Carolina, Pennsylvania, New York, New Jersey and Delaware.

The two most notable occurrences of the Pea Aphis in Ontario were at Freeman, reported by Mr. G. E. Fisher with specimens, and at Ottawa where the insects were found in large numbers from August until the end of October. The attacks upon field peas at Ottawa were unimportant, but the sweet peas in some gardens were seriously injured. For field peas it is difficult to apply a remedy, owing to the way in which this crop covers the ground, but with Sweet peas, spraying with tobacco and soap wash (10 lbs. of native tobacco leaves and 2 lbs whale oil soap in 40 gallons of water) was found very effective. Many predaceous and parasitic insects were observed at work. On the Experimental Farm larvæ of Syrphus flies and Lace-winged flies were common and beetles and larvæ of the two Lady-bird beetles, *Coccinella 9-notata* Hbst and *Hippodamia convergens* Guer, were extremely abundant, as well as the hymenopterous parasite *Praon cerasaphis*, Fitch. In the garden of Mr. Collingwood Schrieber, in addition to the above, large numbers of a new species of Aphidius* were detected. Unfortunately both the Syrphus flies *S. ribesii*, Fab., and the nine spotted Ladybirds were attacked themselves by parasites; but nevertheless they reduced very materially the occurrence of the Pea Aphis. As well as the above-named, larvæ of a minute dipterous parasite (*Diplosis ?*) and a fungous parasite appeared in small numbers in all colonies of the aphis and doubtless played an important part in bringing down the numbers. The undue increase of the various kinds of plant lice seems to be particularly affected by meteorological conditions, and, as in the past there is no record of serious injury to the pea crop by these insects, there is every reason to hope that we shall not have another visitation similar to that of 1899 for some years.

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* Since named *Aphidius Fletcheri* by Mr. Ashmead.

FODDER CROPS.

There have been few complaints of injury to fodder crops during the past season, the usual occurrence of "silverstop" on grasses in old meadows was due to the depredations of small leaf-hoppers. Grasshoppers were destructive only in a few localities. In the Ottawa district a considerable quantity of the common red and mammoth clover was injured by the Smaller Clover weevil (*Phytonomus nigrirostris*, Fab) just before flowering in June, but there was no recurrence noticed in the second crop, and as clover is not grown for seed in the district, the injury was unimportant. The clover-seed midge (*Cecidomyia leguminicola*, Lint.) occurred in Western Ontario; but less complaints than usual were received.

ROOT CROPS AND VEGETABLES.

The various Root Maggots, always so destructive, attacked turnips, onions and cabbages, and, although a certain amount of success was obtained from the use of carbolic applications and the Goff tar-paper disk, nothing new of value was elicited. Dr. W. Gilpin, of Brechin, reports some successful experiments with white-lead applied around the stems of cabbages at the time of setting out. A series of experiments with a diluted application of Jeye's fluid, watered along rows of onions and radishes once a week from the time they appeared above the ground, would indicate that this will prove a useful remedy. Cabbages and cauliflowers similarly treated were also much benefited by this application.

The Diamond-back moth (*Plutella cruciferarum*, Zell.). One of the remarkable attacks of the past season, which was widespread throughout the Province, was by the caterpillars of the Diamond back moth, and occurred upon turnips, rape, and cabbages of all kinds. The injury became noticeable during August, when white patches appeared upon the leaves. Fields of Swede turnips and rape were seen so seriously injured near Stittsville and Ottawa as to look quite white from a short distance, and the crops were materially reduced. The small active caterpillars swarmed upon the leaves, but were found to be attacked by the usual parasite (*Limneria parva*, Prov.). On walking through infested fields the small moths flew up in swarms. Upon the Central Experimental Farm Brussels sprouts were much injured, and rendered unfit for the market by the larvæ eating their way inside the nubs. The habits of the caterpillar render the successful application of remedies difficult; for the most part they work beneath the leaves, and at the slightest disturbance let themselves down by a silken thread. Remedies which have been used successfully are dry applications, containing Paris green and pyrethrum, or a kerosene emulsion spray; but all of these must be used promptly on the first appearance of the enemy.

Blister beetles (*Macrobasis unicolor*, Kirby) did some damage to potatoes in the north-western counties; but as usual their attacks were of short duration, and where spraying with Paris green was practised promptly little harm was done. The closely allied Oil beetle *Meloe Americanus* Leach was found by Mr. J. J. Sheil injuring potatoes at Ariel, Ont.

The Asparagus beetles (*Crioceris asparagi*, Linn.) and C. *12-punctatus*, Linn.) appeared for the first time in Canada during the past summer. The two species were about equally abundant, and were the cause of loss to asparagus growers at Queenston and other places in the Niagara peninsula. These two beetles have been spreading slowly through the United States for some years. The common Asparagus beetle was first noticed in America 40 years ago; but it was not until 1881 that the 12-spotted asparagus beetle made its appearance, when it was found at Baltimore, Md.

The two species are very unlike. The asparagus beetle is a narrow black beetle about ¼ of an inch in length, very prettily marked; the head, legs and antennæ are black, the thorax red and the wing cases are black, with six silvery white spots, and widely bordered round their edges with orange red. The marks on the wing covers have sometimes the appearance of a black cross, for which reason it has also been called in England, the Cross-bearer. The 12-spotted asparagus beetle is of about the same length as the above; but slightly wider, and has the whole body orange-red, with exception of the antennæ, the feet, the knees and 12 black spots on the wing covers—6 on each. As a rule, the latter is less abundant than the former. The habits of the two species are very similar; but differ in some very important particulars. Those of the common Asparagus beetle are best known. It passes the winter as a perfect beetle, and appears early in the spring, eating into the young shoots when ready for the market, and laying its eggs upon them. These eggs are black and elongated. They stick out conspicuously in every direction from the shoots upon which they are laid. The grubs soon hatch, and are slimy greyish-looking slugs with dark dots, a blackish head and black legs. They frequently do a great deal of harm to young plants. There are two or three broods in a season, and they not only feed on the young shoots, but upon the old foliage of the asparagus. In the case of the 12-spotted species the grubs also live inside the berries. Among the remedies which have proved more or less successful the following may be mentioned: (1) The beating of the beetles and grubs from the plants into nets or broad pans, containing water and coal oil. When collected in nets the insects must be killed by throwing them into scalding water, or water with a little coal oil on the surface; (2) Keeping the beds closely cut in spring, so that no eggs are allowed to be hatched, a few stems are sometimes left for the females to lay their eggs upon. These are subsequently cut and destroyed and other shoots are left to take their place as traps; (3) Spraying the beds at short intervals during the summer with Paris green and water, 1 lb. in 100 gallons of water, will destroy both the larvæ and the beetles; (4) Dusting with lime. It has been found that freshly slaked lime is very fatal to the slimy larvæ, and dusting the beds at short intervals of three or four days is one of the best means of clearing them of the larvæ; (5) The larvæ may also be brushed off the plants with a stick, and if this is done in the middle of a hot day it is claimed that few of them ever get back again, a short time on the hot soil proving fatal.

FRUITS.

The San José Scale investigations have been the means of drawing the attention of fruit-growers to many insects which otherwise would have remained unnoticed, and although no new enemies have to be recorded as having done widespread or serious harm during the summer of 1899, most of the regular pests have been observed. Closely resembling the San Jose Scale are three other species, the occurrence and range of which are now much better known, viz., *Aspidiotus Ancylus*, Putnm., *A. Forbesi*, Jnsn., and A. *ostreæformis*, Curt. The last named of these, a European species, was first discovered in America at Chilliwhach in British Columbia; but it is now known to be present in considerable numbers in many parts of Western Ontario and in the Eastern United States. It most closely resembles *A. ancylus*, and has been, doubtless, confounded with that species in the past. Among remedies for scale insects spraying with whale-oil soap seems to be one of the most effective. Kerosene applied in various forms is also very useful. The application of Bordeaux mixture, consisting of sulphate of copper and lime in water, as a remedy for fungous diseases has also been found to be useful against scale insects by rendering the new wood, it is thought, disagreeable to the young bark-lice when seeking for a suitable place to attach themselves to the tree. Some experiments made by Mr. W. T. Macoun, the Horticulturist at the Experimental Farm, in spraying trees with whitewash to retard the opening of buds in spring, seems to add confirmation to this theory. Trees sprayed early last spring with whitewash are certainly freer from oyster-shell bark-lice than others not so treated.

Tent caterpillars were again this year very numerous and destructive in many parts of the Province, notwithstanding an abundant presence of parasites and a bacterial disease which killed thousands of the larvæ. Early spraying, as soon as possible after the young larvæ hatch, with Paris green, 1 lb. in 100 gallons of water to which is added 1 lb. of fresh lime, is quite effective; but if the spraying is delayed until the caterpillars become nearly full grown, they are much more difficult to kill. The egg-masses should always be sought for carefully during the winter and burnt, and a sharp lookout should be kept at the time the young caterpillars hatch so that they may be destroyed when they gather together in clusters after feeding, either in a web or in the case of the Forest Tent caterpillars on the side of a branch.

Among fruit pests of lesser importance which have been reported during the past summer in Ontario the following may be referred to: The Apple Aphis at Merittou, the

Plum Aphis at Dresden, the Pear-leaf Blister Mite at several places, the New York Plum Scale at four different points, the Pistol Casebearer of the apple at Cobourg and Valentia, Pear-tree Psylla at Winona, and an interesting injury to young plums while green by the caterpillars of the Streaked Hair-streak butterfly reported by Mr. W. M. Orr from Winona.

Of rather greater importance and wider extent than the above were injuries by the Currant Aphis, the Imported Gooseberry Saw-fly, the Pear Slug and the Eye-spotted Bud Moth. Mr. J. Van Horn sent specimens of the Fruit Bark Beetle (*Scolytus rugulosus* Ratz) from Chatham. This was first recorded as occurring in Canadian orchards last year.

GREENHOUSE PESTS.

Under this head two new enemies have to be reported. Both were found in the extensive houses of Mr· J. H. Dunlop in Toronto. The Black Violet Aphis (*Drepanosiphum violæ* Pergande), which has been referred to from time to time in United States publications, was found in some abundance. As an aphis this is a beautiful species, although destructive where it occurs in numbers. It has been treated of in a special bulletin (Circular No. 37, Second Series) issued by the U. S. Division of Entomology, where the value of fumigating with hydrocyanic acid gas in greenhouses and cold frames is shown. While testifying to the effectiveness of the common remedy of fumigating with tobacco, it is pointed out that it requires repeated use at short intervals, and that it may even "cause serious injury to plants. In the case of violets, it has been found to be only of slight value against plant lice working in the bud, and, while it may destroy the so-called green aphis when exposed, it is not effective in killing the black aphis. Moreover, tobacco may prove injurious to the foliage and flowers, bringing on epidemics of 'spot.' Tobacco is also useless against scale insects in general and mealy bugs." The bulletin quoted from, is of very great value to horticulturists and others who grow plants under glass, but particularly to violet-growers. Violets are an expensive crop to grow, and this bulletin is the record of experiments which were specially undertaken to overcome the difficulties of treating violets under glass. Full particulars are given as to the methods of applying the remedy and the strength of gas to be used for various crops. The following quotation will illustrate the value of this pamphlet :

"Double English Violets—'Marie Louise,' 'Lady Campbell' and others. For plant lice and general fumigation fifteen-hundredths of a gram of 98 per cent. cyanide of potash for each cubic foot of space is required. The exposure, if made according to directions, will not hurt the plants in any stage of growth. The gas has been used on a large scale in fumigating violets for the past three years with the greatest success, only a few treatments during the season being required. Leaf-eating larvæ, slugs, millipedes, cut-worms, etc., when exposed are killed as well as plant lice. Red spiders, however, are not entirely eradicated by the treament. The foliage of single violets like California and Princess of Wales are sometimes slightly injured by the stronger dose of gas. A weaker dose (one-tenth of a gram potassium cyanide per cubic foot) should be used when they are to be treated.

"Other Plants.—Other plants on which the gas has been tried on a small scale indicate that it may probably have quite a wide range of usefulness."

The other new pest is the caterpillar of a small moth, *Phlyctænia ferrugalis*, Hbn. This is a very slender leaf-eating caterpillar when full grown, about three-quarters of an inch in length. It is of a semi-translucent green in colour, with a double white band on each side of the dorsal vessel and two distinct black spots on the second segment. The head is white clouded on the cheeks with brown When at rest the caterpillar has the habit of curling the head and the first two or three segments round at the side of the body. These caterpillars have done a good deal of harm in Mr. Dunlop's rose houses, and he complains of their working all through the season. The injury seems to be done chiefly by eating the parenchyma from the lower sides of the leaves. The specimens bred from Mr. Dunlop's material were kindly identified by Prof. C. H. Fernald, who also referred me to the article in the Michigan Experiment Station Bulletin, No. 102, by Mr. G. C

Davis, who treats of it as an enemy of celery, in which plant it is said to both bore into the stems, channelling at the base of the leaf stalks and leaving nothing but a shell on the outer side, and also feeds on the leaves, the larvæ being found either rolled up or sewed in between them. Mr. Davis states that Prof. Fernald had written to him that "to his knowledge the species had never been bred in this country before. In an English periodical, Entomologists Monthly Magazine, vol. 14, pages 200-4, all the early stages are fully described. The species was bred on the leaves of Boneset (*Eupatorium*), and was also taken on Hedge Nettle (*Stachys*) and strawberry leaves. It is thought to be two or more brooded."

SOME OBSERVATIONS ON A BUMBLE-BEES' NEST.

By Rev. C. J. S. Bethune, London, Ont.

In the Head Master's garden at Trinity College School, Port Hope, I had planted a clematis in the angle formed by some stone steps and the brick wall of the chapel organ-chamber. In the spring of 1897 I put some cut grass from the lawn at the base of the plant to serve as a mulch and keep the ground moist about the roots. A gravelled walk ran parallel to the building at a distance of about a yard, with a branch at right angles to the stone steps; between the clematis and the walk there was a densely growing young lilac tree. The creeper grew with great rapidity and I found it necessary to support it with wire netting. One day when putting this up, I noticed that whenever I touched the cut grass there came from it an ominous bizz-z-z. I thought it was only a Queen Bee looking for a deserted mouse's nest, but subsequently discovered that the "bizz" was always there when I poked the grass. Later on the worker bees were to be seen coming and going, and there was always a sturdy sentinel at the entrance to the nest. My man-servant, who did not by any means share in my interest in all things entomological, wanted very much to destroy the nest as he was afraid of being stung by my friends the bumble-bees, but I would not allow him to do so. He then tried to drown them out when watering the lawn with the hose, so I protected them with a slanting piece of slate, which left a space between the top of the nest and its new roof.

One day in the middle of summer I dropped some bits of cut grass beside the slate, and found that the bees soon carried them off inside; I then gave them more and watched to see what they would do with it. Two of them apparently attended to this work, and they were most industrious, never seeming to stop throughout a long summer's day. The outside bee would run about, seize a bit of grass and pass it swiftly between his legs, under the length of his body, backwards,—and then another, and so on, till he got it all near the opening at the end of the slate—the end opposite to that at which the family went in and out. He then began again at the little pile that he had collected, and passed the bits of grass in to his companion under the slate—always sending them between his legs backwards. It was most interesting to watch the operation, and I paid frequent visits to the nest during the day to see how it was going on. After a time that opening was pretty well filled up with grass and the workmen took a rest.

Though bumble-bees were visiting the flowers close by until late in October, I very rarely saw one go in or our of my nest after the middle of September, and felt strongly inclined to think that my man must have drowned out a good many of the colony. He never neglected to water that clematis! I was quite grieved when one day I found my friend the door-keeper dead just outside the entrance, where he had so faithfully done his duty during many long summer's days. This was after some chilly nights, when there had been a slight touch of frost.

Towards the end of November, long after any bumble-bees were to be seen in the garden, I dug up the nest in order to send it to Dr. Fletcher, who wished to see whether there were any parasites affecting the bees. I found that the bees had done a good deal of excavation and gradually hollowed out the place for the nest till they had sunk it so that the top was level with the soil—it was started originally on the surface. They must have dug a hole at least three inches deep the whole size of the nest. The earth was brought out in pellets and formed into a neat little embankment, or causeway, against the wall, leading away from the entrance. They were a very orderly and peaceable family, and never annoyed any one, though passers-by were frequent along the gravel path not a yard away, and up and down the stone steps at the end of the nest.

It cannot be too often repeated that bumble-bees are decidedly useful insects, and do much good work for farmers and fruit-growers. Their hairy bodies are specially adapted for carrying pollen from one blossom to another, and thus they are instrumental in fertilizing many varieties of fruit-trees, melons, cucumbers, pumpkins, etc., clover, red and white, and various flowers, many of which would be unable to produce any seeds but for the kindly offices of bees.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

The First Annual Meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, N.W.T., in the Agricultural Hall on Tuesday, the 7th November, 1899. At the request of the President, the chair was taken by Griffin Fletcher, Esq., J.P.

Agriculturists were well represented. The minutes of the last ordinary meeting were read and approved. Letters were read from Mr. J. A. Guignard (in the absence of Dr. James Fletcher); Dr. L. O. Howard, of Washington; the Bishop of Calgary and Saskatchewan: Dr. Sanson, of Banff; F. Oliver. Esq., of Edmonton, M.P., and a very large number of other gentlemen interested in the work of the Society, expressing full sympathy with its objects.

The Chairman, in a few opening words, explained that the object of the meeting was to popularise the Society amongst farmers, by showing the use of Entomology and Botany, and that a number of gentlemen had written special letters with advice, which would be read after the addresses on the agenda had been delivered.

The Chairman then called upon the President, Mr. Percy B. Gregson, to address the meeting. (See page 114).

The President then read an address by the Revd. C. J. S. Bethune, D.C.L., upon "The Use of Entomology."

An address from Mr. H. H. Lyman, M.A., (the President of the Entomological Society of Ontario), was next read.

The suggestion in Mr. Lyman's address as to affiliation of the North-West Entomological Society was discussed, and it was decided that at present affiliation was impracticable, owing to the somewhat original course adopted by the North-West Society, (of which details appear in the Report of Council).

An address by Dr. Henry George, M.R.C.S. (Eng.), of Innisfail, Alta., on "The Pocket-Gopher," (G. bursarius) was next read by the President.

Numerous letters in support of the President's course of procedure were next read from members of the Society, among them being a letter from The Bishop of Calgary, in which His Lordship (after remarks as to the uphill work before the Society) advised quarterly meetings, to which the public should be specially invited; a letter from Mr. E. Firmstone Heath cordially supporting the President's project of giving sketches of insect life to the school children and parents, and of holding quarterly meetings for interchange of experiences; from Mr. A. W. Hanham, Mr. F. Oliver, M.P., Dr. N. B. Sanson, of Banff, Alta., and several other gentlemen to the same effect.

Mr. Hanham and Dr. Sanson suggested the formation of a "Naturalists' Club," but, in view of the scattered community, it was decided to be impracticable at present; but that a suggestion by Mr. Heath that some kind of Natural History Periodical might be published eventually by the Society, which would be circulated among the public, should be seriously considered at the earliest opportunity.

A letter from Mr. C. W. Peterson Deputy Commissioner of Agriculture, Regina, was then read, in which he remarked among other things upon the importance of investigations into the insect life of the country, and mentioned an estimate of damage done by insects to crops of the United States at $300,000,000 per annum, and concluded with expressions of the Commissioner's appreciation of the President's efforts to create an interest in Entomological and Botanical matters in Alberta and the Territories.

A letter from Dr. L. O. Howard was also read, in which, after wishing success to the President's work, Dr. Howard remarked that though the actual value of this class of work could not fairly be reckoned in dollars and cents, yet that there was no doubt that hundreds of thousands of dollars were saved to the farmers of the United States every year by the carrying out of the recommendations of the State Entomologists. Dr. Howard also, in approving of the encouragement of nature study in the local schools, advised the display of insects characteristic to the locality.

The Chairman then read the Report of Council.

The election of fresh members then took place; and the election of officers for the ensuing year; Percy B. Gregson remaining President of the Society.

The Rev. Matthew White, of Lacombe, was elected Vice-President: Arthur D. Gregson, J. P., of Waghorn, the Librarian-Curator; Percy B. Gregson, the Secretary-Treasurer; and the Rev. J. Hinchliffe of Red Deer, Alta.; William Wenman of Red Deer; T. N. Willing of Olds; and F. H. Wolley-Dod of Calgary, as Members of Council.

Before conclusion of proceedings, Mr. C. T. Daykin announced to the meeting that the President had already arranged to give every month at the Waghorn School-house a short sketch on the life of some insect, or of some other phase of nature, and its economic value, and the date would be published in newspapers in time for every one to attend, and the sketches would interest not only the young folk but "grown ups."

The Chairman then read a letter just received by the President from Mr. Arthur G. Wolley-Dod (Vice-President of the Calgary, and Secretary of the Fish Creek, Agricultural Societies), requesting the President to prepare a short treatise on insects and their value as regards agriculture, which he could read at the forthcoming Agricultural Societies' annual meetings in December.

The Secretary of the Lacombe Agricultural Society also requested a paper by the President for reading at the December annual meeting of the Lacombe Agricultural Society.

After a vote of thanks to the Chairman, the proceedings terminated.

REPORT OF COUNCIL.

In submitting its First Annual Report, the Council take the opportunity of recording their sincere expressions of gratitude to the many gentlemen high in the Entomological and Agricultural worlds for their sympathy—their actual co-operation—with the work of the North-west (Canad Entomological Society. The Society has embarked in an enterprise in a distant and comparatively unknown land, whose settlers are pioneers and from many parts of the globe, and untutored; and the advantage to the Council in having advice from such men as the Founders of the Entomological Society of Ontario, Dr. James Fletcher, Dr. L. O. Howard, and Mr. C. W. Peterson, cannot be overvalued.

The Society's Collection of Insects has been greatly augmented by gifts from Dr. Sanson, of Banff; Dr. Herman Strecker, of Reading, Pa.; and Dr. Henry Skinner; and other gentlemen, including Messrs. W. Wenman, E. F. Heath, T. N. Willing, H. Hutchinson, A. W. Hanham, and A. J. Dennis have kindly promised examples representative of their respective districts. The Society's Collections are always on view to the public.

Mr. E. Baynes Reed, the Rev. Dr. Bethune and Prof. James have presented to the President the entire set of Reports of the Entomological Society of Ontario. Dr. James Fletcher, a full set of his Reports since the establishment of the Ottawa Experimental

Farm; Dr. Howard, a large number of Reports and publications of great value (bound and unbound) from his Department; and to these the President of the North-West Entomological Society has added a number of other works on Entomology, Botany, and Geology.

The Council, noting the large influx of immigrants into Alberta from all lands (Swedes, Bohemians, Galicians, Russians, Norwegians, etc.), realises their great need for a right apprehension of the value of economic entomology.

The Council begs to tender the reason for the absence of a balance-sheet and statement of expenditure:—In founding the Society the President elected to defray every expense, until its objects should have become appreciated, and a course of procedure formulated. The kind recognition of the value of such a Society in the North West, coupled with much practical advice, has made the way the President should pursue clear and defined, and a way which has received the fullest approval. Pursuing strictly this course, the President of the Society purposes to give a monthly sketch in the local Public Schools before the children and their parents on insect life or other phase of nature and its economic value; and to call quarterly meetings at different points of the members of the Society, to which the public will be specially invited, for interchange of experiences, etc., and receiving accounts of new insects and weeds; and to submit short papers for reading and discussion at the meetings of local Agricultural Societies.

Presented on behalf of the Council.

PERCY B. GREGSON,
Secretary-Treasurer.

7th November, 1899.

ADDRESS BY PRESIDENT OF N. W. ENTOMOLOGICAL SOCIETY

Ladies and Gentlemen, and members of the North West Entomological Society:

A year ago a few of the members of this district felt that the time had come when the insects of this great North-West should receive more attention. With the spread of immigration "bugs" and "grubs" of various sorts had also spread westward, and the greater part of the country itself was practically unexplored, as far as insect or plant life was concerned.

We met, therefore—a few of us—and the outcome of the meeting was the formation of the North-West (Canada) Entomological Society. We have been exceptionally favoured in having the sympathy and advice of men of large experience and influence: I allude to Dr. James Fletcher, the Dominion Entomologist; to Prof. James, Deputy Minister of Agriculture for Ontario: to Mr. C. W. Peterson, our own Deputy Minister of Agriculture; the Bishop of Calgary; Mr. Oliver, M.P.; Mr. Simpson, M.L.A.; Mr. E. Baynes Reed, the Government Meteorologist at Victoria; the Reverend Dr. Bethune, Editor of the Canadian Entomologist; the Reverend G. W. Taylor, Government Entomologist for British Columbia; Mr. H. H. Lyman, President of the Entomological Society of Ontario; Mr. Young, Editor of the Calgary Herald; Dr. Herman Strecker, and many other gentlemen (all of whom are members of the Society). By the generous gifts of Mr. Reed, Dr. Fletcher, Dr. Bethune, Prof. James and Dr. L. O. Howard of Washington (The Government Entomologist for the United States) a nucleus for a good library has been formed. Other gentlemen, including Dr. Sanson, of Banff, Mr. T. N. Willing, and Mr. E. Firmstone Heath of Manitoba, have donated insects, and we owe to the generosity of Mr. Edmond a serviceable working microscope.

So much for the introduction of the Society, but before proceeding to the object for which this meeting has been called, I wish to publicly and most sincerely thank the number of gentlemen who have been so kind as to write, with assurances of their continued support and sympathy with my efforts, while regretting their inability to attend this meeting. These letters will be read presently.

We now come to the objects of this meeting, and I am very heartily glad to see so *large a gathering.* The question I am most frequently asked in connection with this society is; What is the use of it? This is a practical age, and farmers cannot afford to look at anything they have no use for. Now, an entomological society is simply another name for a society of persons who are making some sort of observations about insects—not merely butterflies—but grubs, bugs, worms etc., and the points I wish to show are, that some knowledge of insects is very important to all of us who are engaged in agriculture, so that we may rightly distinguish between our insect friends and our insect foes; and some knowledge of insects is also necessary in order that the farmer may know how to deal with his insect foes, and how to make the most of his insect friends.

Now to see how to deal with insect foes, we must first of all learn something about them; there are many, like the Hessian Fly, whose grubs do all the harm and many others, who themselves as well as their grubs do the harm, like the Colorado Beetle. Insects that themselves do harm, do so by mouths that bite or mouths that only suck. Those that bite have jaws, with which they bite off solid pieces of food from the plants or annimals they attack. Some poisonous material must therefore be placed *on their food*, so that when this food is eaten by the insects they may be destroyed by the poison. Those insects that suck, have no jaws, but sharp hollow beaks through which they suck the juice of the plants or blood of the animals they attack. For sucking Insects it is therefore useless to place poison on the plants, because, having no jaws, they only feed on liquids such as juice or blood, for which they have to sink their beak-like tubes beneath the surface of the object attacked. For this class of insects, substances, which kill by coming into contact with the bodies must be used, e.g., kerosene and soap emulsion, or oils, which stops up the breathing organs, The losses in agricultural products from insects and their grubs is reckoned at fully ten per cent.

A few of our common insect foes in this country are pretty well known. There is the red turnip beetle, which destroys our Swede turnips [example of Entomoscelis adonidis Fab, produced and handed round]. The little turnip "fly" which destroys the young turnips when in first "leaf". These "flies" are really little beetles, and, like all beetles, pass through the grub and chrysalis stage, so that if we learn the probable date for hatching (for all insects are very regular) we shall know when to sow the turnip seed—They should be sown either sooner than the beetle hatches, so as to get their second or third rough leaf before it hatches. or they should be sown so much later than the hatching time so that when the "flies" hatch they have to starve. And we must now, it seems, look out for the Colorado beetle, or potato bug. It has appeared in two or three places in Alberta this summer, and last year was injurious in several parts of Manitoba. The red turnip beetle is sometimes mistaken for it, but the potato bug has ten stripes altogether, and the red turnip beetle has only three, but both are destroyed by the same treatment (Paris green solution).

Now, all the insects I have mentioned have jaws, so that they are "biting' insects, and the remedy against them is to sprinkle poison on their food.

Then there are the grubs that work underground or at the surface of the soil. We all known the garden "cut-worm". This is a caterpillar, which eventually developes into a very common moth that flies about our lamps and windows in the fall, and which is easily caught and destroyed. When in the "grub" stage, it is very destructive to our young cabbages and other young plants. It lodges during the day just under the soil—you can find it in the mornings by the small hole it leaves in the ground near the plant it has attacked over night. They come out only at night, and then they nibble through the small stem of the plant, and sometimes draw the leaf down into the soil to consume at leisure. Now these grubs are very fond of bran, so that a little damp bran with a very small quantity of dry Paris green stirred in (proportions 50 to 1) will be sure to destroy them, or wrap paper round your cabbages when you plant them out. Another very common grub in our potato patches is the wire-worm. These are a nuisance in the way they work into our best potatoes. The wire-worm lives in the ground through the winter, and in the spring, after going through one more stage (pupa), develops into a small brown or black beetle, called a "click" beetle, because when the beetle is touched it gives a quick spring away. These beetles we should learn to recognize as our foes and should kill them all on sight, because it is from their eggs that the next crop wire-worms will come. And so we see that by knowing the life history of these things we get a double shot at them. We kill the worm, and we also know its parent, the "click" beetle, and kill it.

Among the *sucking* insects are various kinds of lice. They have only long beaks, for sucking, but no jaws. We find them on animals and plants, and as they get their food by sinking their beaks (which are as sharp as a very fine needle) through the surface, any amount of poison on the surface will not kill them, so the way to attack them is by something that will stop up their breathing organs and suffocate them, *e. g.*, coal oil emulsion, tobacco decoction or smoke. And so there are many other insects which we soon learn to recognize as foes, and by knowing their habits and how and when they breed, we can learn how to deal with them. There are foes all around, grubs eating our poplar and other trees, our fence posts, spruce trees, etc.

To come now to our insect friends. We have many among our ordinary beetles, and whenever we recognise any of our friends among them we should be careful not to destroy them. In our gardens and fields there is a beetle called the "fiery" beetle, which has six rows of bright bronze spots on each wing cover. This insect in two of its stages (grub and beetle) feeds on the cutworm and wireworm. It attacks the cutworm so eagerly that it is often called the "cut worm lion beetle." [Specimen of Calosoma calidum, Fab., handed round]. Then there is a smaller beetle (black) called the "ground beetle," which also feeds on cutworms, etc. [Specimen of Harpalus caliginosus, Fab., handed round]. The "tiger" beetle is also a great friend of ours in that way. [Example of Cicindela vulgaris, Say, handed round]. And the familiar little "lady-bird" (of which there are several varieties) lives on nothing else but our insect foes. It's "grub" devours wholesale the young plant lice and the young of turnips and potato bugs. Wasps, too, are among our insect friends and all "dragon-flies." Besides these and many other of our friends which we can see every day, there is a host of minute flies, whose grubs feed upon our enemies and should not be recklessly destroyed.

A good general agricultural remedy is summer fallowing, as it starves the insects, and exposes them to birds, etc. You might try a small patch next year, and see the effect. Then late fall plowing will turn up to the frost and so destroy hundreds of wireworms and other grubs. We have also many friends among our common birds, such as jays, crows, and all sorts of wood-peckers. Wood-peckers never attack a tree, either dead or alive, unless there are grubs first eating the tree, and it is to get at these that they peck the trees at all. Their long tongue works into all the cracks of bark, etc. And this year there has been an unusual number of toads. Toads do no harm and feed almost entirely upon insects, and should be carefully protected accordingly.

Among our enemies too is "smut," though this is really a fungus. This is a fungus on grains, and, while always a pest, is rather more prevalent this wet year than usual. The bad features of "smut" are that it lowers the standard of purity in the flour, and it takes away from the profit of the crop. A deduction of 8 p.c. is a fair estimate of the loss from smut alone to the farmer, and the worst of it is a "smutty" plant does not thin out the stand and give the healthy plants more light and soil. It takes up just as much room, and requires as much nourishment and moisture from the soil as do the healthy ones. One single germ of smut coming in contact with a healthy grain will infect it, and smut germs are easily blown about by the wind, or carried from field to field by threshing machines.*

It often seems strange that there should be in the ground so many cutworms and other grubs, but this would not be the case if the land were kept perfectly clear of weeds. Weeds, such as Lamb's quarter, are their natural food, and where these grow the insects naturally go in order to lay their eggs, which hatch into the grubs.

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*NOTE—In answer to several enquiries at the meeting as to the remedies to prevent smut, I gave the *general formula* advised by Dr. Fletcher in ordinary cases, viz.: Dissolve 1 lb. of bluestone in a quart of *hot water, which is then sprinkled* by one person over 10 bushels of wheat or barley, placed in a wagon-*box, whilst some one else keeps* the grain well stirred. Oats should be *submerged*, not sprinkled only.

There has this year appeared among us for the first time a tiny grey "plume" moth, whose larva is very destructive to clothes, furs, sacking, etc., and whose presence in this country can only be accounted for by coming with outfits of new settlers.[†] It will be interesting to see if it reappears next year. The moth is in great abundance, and if its eggs hatch next spring, it will become a troublesome household pest, and we can only hope that a dry year will exterminate it. We know that many insects and the grubs of others stand extreme degrees of cold. In this North-West they often endure 50 or 60 below zero without injury, so that we cannot rely on winter to destroy them. If they reappear, we must be prepared with a remedy.

I thank you, Ladies and Gentlemen, for having heard me so patiently, and I come now to the suggestions I have to make. The large immigration that is being attracted to this country is in one respect a source of danger, because there is always a liability of any new settler inadvertently introducing a new weed, or a new insect, which may turn out to be a pest. We should therefore be on the watch, and that is one of the reasons why I have invited so many agriculturists to join an entomological society. I wish the heads of all our agricultural societies to become members, so that by personal intercourse, by correspondence and quarterly meetings (which I will try to hold at different points along the line), we can keep in constant touch with each other, and the presence of any troublesome or new insect or weed in any locality can at once be ascertained and kept under control before it becomes aggressive. We have already on our members' roll agriculturists scattered throughout Alberta and Manitoba, and on the roll are the Presidents or Secretaries of our own (Lacombe) Agricultural Society, and of that of Red Deer, Innisfail, Calgary and Fish Creek, and I hope soon members of other agricultural boards will join.

Many of our leading members wish the Society to issue a small periodical magazine, and it seems to me that we might do so every quarter. This magazine would, with other matters of interest to the farmer, mention new insects or weeds affecting us, and sketch the life history of some insect or animal or trace the progress and effect of some weed, or treat of some other phase of natural history, and be circulated in the country.

Another suggestion I have to make, which is, that the young folk of this country might be made to take an interest in the flowers and insects they see around. They would soon understand their value as affects agriculture. The young are the coming generation, and what they can learn now about these things will stand them in good stead when they are older. They will soon take a real interest in these things. It will be like a new world to them, a world peopled with hundreds of different forms, and every one of which will have a beauty and interest of its own. The powers of observation of our children would grow, and every spark of knowledge they gain of insects and plants would make them fitter men and women.

This brings me to the answer of the question with which I introduced this Society. The question I asked was :—"What is the use of an Entomological Society?" In mentioning certain insects I have alluded to certain remedies, and, though there are certain standard remedies now very well known, they are the outcome of many trials and experiments by people who study these things. In most instances of insect pests their entire life history has to be observed, and the various stages they pass through and their habits carefully investigated. And we must remember that although we ourselves may know how to deal with insects (both foes and friends), there are thousands of immigrants from foreign lands now settling around us who have never heard of any remedies against insects. There are Galicians, Russians, Finlanders, Swedes, and many others. These will have just the same insects to contend with as we have, and it is our privilege—even our duty—to see that they also are made acquainted with our tested remedies, and methods of dealing with them.

The Society is, however, not confined to the economic side of entomology and botany. It has been organized also to collect and investigate insects of various orders.

[†] Genus *Alucita*, Linn.

The field of its operations is very little known, and we hope that in course of time the society will be in possession of a collection of rarities from districts hitherto unexplored, which will be contributions to science. We hope, through our members, to extend our researches further north and north-west next year, and to gradually increase our field, and any discoveries made will be recorded in one common centre and published from time to time. There are very many boreal and arctic insects whose life histories are unknown, and these as far as possible the society will endeavour to work out. Of course at present we are a small body, but everything must have a beginning, and we hope and believe that, with loyal and earnest members, the Society we now are is but the nucleus of one which will be of much use both to science and to the Canadian farmer.

PERCY B. GREGSON,
President.

THE USE OF ENTOMOLOGY.

BY THE REV. DR. BETHUNE, LONDON, ONT.

Everyone interested in the cultivation of the soil, whether for profit or pleasure, every farmer, gardener and fruit-grower, will require but a short experience to convince him that he has a hard and never-ceasing battle to fight in order to reap a due reward from his labour. After he has duly prepared his ground and put in his crop, of whatever kind it may be, he is sure to find, before it comes to maturity, that there are many enemies who will try to rob him of a large portion of the fruits of his toil. Oftentimes there will be no visible token of their presence until the ingathering reveals a diminished or damaged return; in other cases injury will be apparent, but the enemy who wrought the mischief cannot be seen, the mysterious foe is working by night, or contrives to hide himself so completely from observation that only the destructive results are apparent, while the culprit keeps out of sight.

It will readily be guessed that the enemies I refer to are injurious insects. Their name is legion and their numbers are as the sand of the sea shore. Every plant that grows, whether great or small, is liable to attack—it may be in the roots underground, in the stem or trunk, in the bark or wood, in bud or leaf or branch, in blossom, seed or fruit, and after the grain has been safely housed or the fruits and vegetables stored for the winter's food, there are still foes to be fought, insect enemies to be guarded against.

With such myriads of minute creatures to contend against, working in such diverse manners, the contest might seem a hopeless one, and indeed it would be were it not that nature has imposed her own limitations, and no single insect foe is long allowed to pursue its way unchecked. Where we have to deal with species native to the country, we may feel sure that however much the injurious kind has been allowed to multiply and spread, it will not be long before the balance is restored and the damages reduced to an average amount. But when we are invaded by species introduced from a far distant land, especially those brought from across the seas, the case is usually very different. The enemy arrives in our midst, unaccompanied by the predaceous insects, parasites or diseases that keep down his numbers in his place of origin, and he rapidly increases and multiplies without let or hindrance, until artificial means are employed for his subjection. In such cases the farmer or fruit-grower may suddenly find himself confronted with a mischief-worker whom he has never seen before, and with whom he has no idea how to wage a war. His plight may be a serious one, and his losses more than he can bear; he knows not what to do nor where to turn for relief. Hitherto, in Alberta, there has been no help at hand, but now we may rejoice that measures have been taken to give assistance and advice wherever they may be needed. The North-west (Canada) Entomolcgical Society has been organized mainly for the purpose of doing good to all the dwellers in the Territory who are employed in the cultivation of the soil. It is their business, and also their pleasure, to study the insects that dwell in the land, to trace out their life-histories, watch how they work, learn their habits, whether they are noxious or beneficial, or simply beautiful, and then to study and experiment upon the best means of getting rid of the enemy and encouraging the friend. It will help on the cause very greatly if every farmer will take note of the insects affecting his crops and give all the information he can to the Society ; and also send specimens of both the creature and its work.

The entomologist does not pretend to a universal knowledge of insects, but he can usually tell at a glance whether a specimen belongs to a good or evil tribe, and if it should be new to him he can always apply to his correspondents in other parts of the continent for the information that they have been able to acquire. Science knows no political or geographical boundaries, and help may be sought and will be promptly and cheerfully given whether the application is made to the entomologist in charge at Ottawa or Washington. In your case you have the satisfaction of knowing that this department at Ottawa is in the hands of Dr. James Fletcher, who has often visited the North-West Territories and made himself familiar with the most important of your insect enemies. Should the local members be puzzled over some new importation or immigrant they may feel sure that any assistance they require can be obtained from Dr. Fletcher. But they do not by any means intend to be dependent upon one who is many hundreds of miles distant ; they mean to be up and doing for themselves and to spare no pains till they get toknow as much as they possibly can about the insects that infest the country round them.

The ordinary entomologist is often looked upon by his acquaintances as a somewhat silly person who devotes much of his time to chasing butterflies and searching for bugs and beetles, but this is work that has to be done. We must collect the insects in our neighborhood and study them before any progress can be made—we must find out their names and the families to which they belong before we can make use of the records and observations of others ; we must rear them through all their stages and watch their habits before we can be sure what remedies will be available against them. It is a vast, and endless work, one that may well engage a multitude of enthusiastic students and which should enlist the co-operation of every farmer and gardener in the land. Every one may help by keeping his eyes open and making known his observations to the members of the Society. Any unusual visitation of insects, whether as regards numbers or effects, should be at once reported, and the results of any experiments placed on record. Insects should by no means be ruthlessly destroyed unless in the form of caterpillars, grubs or plant lice, they are found in the act of devastation. There are many kinds that are really the farmer's best friends, and it would be a sad mistake to slay the benefactor with the wicked. This shows the necessity of a little knowledge of the subject ; every one, for instance, ought surely to know that a lady-bird is a most useful destroyer of plant-lice, and so, also, is a Syrphus and a lace-winged fly, and yet how few there are who would recognize the two latter if they saw them. A beginning ought to be made with the children. They take an instinctive delight, as a rule, in living creatures and are charmed to learn something about them. An hour a week at school devoted to the elements of entomology and botany in a practical form would be of untold benefit in the course of subsequent years.

I have only attempted in this paper to give a brief outline, in general terms, of some of the benefits to be derived from the study of entomology ; those who are on the spot can enter into details and discuss the special insects that are present causes of anxiety. I would only say further that entomology means money—means dollars and cents lost or saved to the farmer, fruit-grower and gardener. If the Hessian-fly has this year, as is reported, destroyed in some cases 25 per cent., and on the whole from 5 to 10 per cent. of the vast wheat crops of Manitoba, just think of the millions of dollars that that means ! What more useful work, then, can be undertaken than the effort to save at least a portion of this immense sum ? Entomology can do it, if the farmers will only believe it, and adopt the measures that its experience in other regions has proved to be effective. The expenditure on the part of the government of each Province or Territory of a few thousand dollars a year in securing the services of a trained entomologist and in disseminating broadcast the requisite information would enable the whole of the farming community to unite in an intelligent plan of campaign against the common foe and clear their fields of the insidious pest. If a pack of wolves were to come down from the mountains and ravage the flock and herds of the community, carrying off and destroying one-tenth of the cattle and sheep, it would not be long before every man in the country who could fire a gun and ride a horse would be in hot haste to join in a fierce onslaught upon them. Why should there not be an equal effort and an equal determination to get rid of an insect enemy that causes the loss of just as great an amount of most valuable property? In the one case there is, to be sure, the instinctive love of the chase and all its attendant excitement, while in the other there is the humdrum adoption of some special date of ploughing, some particular variety of seed, some careful burning of stubble, some extra cleaning of grain,—perhaps some little expense, not for powder and shot, but for remedial applications.

There is another side, also, I am glad to learn, to the North-West Entomological Society. It is paying attention to practical Botany, and also to Geology. The latter, to the ears of most, conveys the word *gold*, and I need not, therefore, refer to the value of it,—but all I have said about the study of insects applies equally well to that of weeds. The one are as ubiquitous as the other, and it is quite evident that over the vast prairies of the North-West, with their rich soil and luxurious vegetation, weeds are going to prove as tough a problem as the worst of our insect foes. Here, too, all can do something—all can co-operate. No man should be permitted to let his neighbour's fields be sown with the seeds of weeds that he has been too lazy or too careless to cut down. But many weeds are blown for miles across the land and have to be dealt with in various ways. These are matters to be studied and objects upon which experiments must be tried,—and here, too, comes in the necessity of some education, some elementary information by means of which a noxious weed may be distinguished from a useful or a harmless plant.

I am writing from a long way off and to dwellers in a land that I have never seen, but in matters of science distance makes no difference. We are all brothers in search of truth. We are all at one in our desire to help each other in any way we can—to lessen the toil and cheer the labours of those who are preparing the way for a rich and prosperous community, a goodly province in the Empire of our Queen and the Confederacy of our Dominion.

ADDRESS BY DR. HENRY GEORGE, M.R.C.S., ENG., L.R.C.P.

Mr. President, ladies and gentlemen, and fellow members of the Northwest Entomological Society, I am glad to greet you. As long as I have been in Alberta—some ten years—I have looked forward to this time, when men are ready to use both brains and eyes, and not merely till the ground and perform various other labors in these almost wild parts of the world.

I take it that the chief object of this Society is to enable the farmer to distinguish between his friends and enemies, as relating to his crops, grasses, domestic herds, &c. Birds, animals, insects, weeds, are all under this head; and it behoves us to help our Secretary in his praiseworthy endeavor to make us understand and learn how to distinguish between what we should destroy as vermin and what we should protect as beneficial to the agricultural interests.

I may say that the love of observing nature has been born in me, and when I came out here and heard a man called a "bug hunter" I was much insulted, as I had never before connected that obnoxious word with anything except the little insect that disturbs night's slumbers in some cases. But I might bring these remarks to an end as the Secretary has kindly asked me to pick out some animal or bird and give you my observations and readings on the same. I am going to give you a few words on the

POCKET GOPHER. (*G. bursarius*).

This animal is like the English mole in many respects, but differs in others. Like the mole it lives underground and throws up small heaps of fine earth, having "runs" under the ground. Its fur, both in texture and color, is very similar. It looks like a large mouse; is thick set, with a short tail, almost devoid of hair. Its claws are long for digging, but are not shaped like the mole's; also, its teeth are quite different, showing that they live on different diets. The pocket gopher is essentially a rodent, i.e., one of the gnawing animals, having the four inscisor teeth long and like chisels, whereas the mole has regular flesh-eating teeth, and is insectivorous chiefly in its diet. The reason this is called "pocket" gopher is because it has on each side of the mouth two pouches which are just like the fingers of a glove when turned inside out. They are outside the mouth, so that when filled have to be emptied by the forepaws which press out the contents. These animals are more destructive than useful, and though I have no doubt that they kill many insects yet they chiefly live on roots of grass, grain, &c., also are fond of potatoes, carrots, and most of the farmer's root crops. They chiefly come up from the ground in the twilight and form one of the chief foods of the long-eared and short-eared owls. I have seen them in the day-time but rarely. I understand that one of the best ways of catching them is by putting a trap in the "run" between two heaps of earth. This is one of the farmer's foes and wants destroying. It's heaps of earth are unsightly, and do harm in covering up grain and seeds too deep; their "runs" take away earth from the roots of grass, grain and shrubs, and lastly they eat and destroy root crops.

With many thanks for listening to these few words, I must conclude; but I hope to see this Society progress and take its place as one of the first scientific societies in the great North-west of Canada.

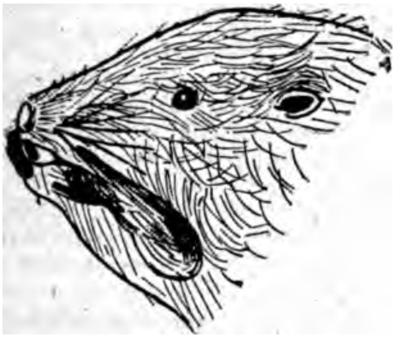

FIG. 65.—Head of Pocket Gopher.
Life size.

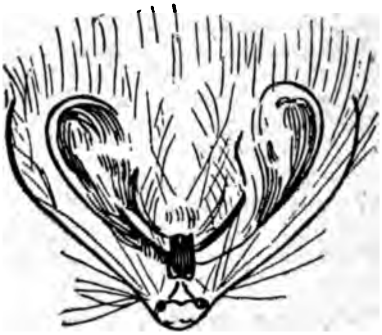

FIG. 66.—Underside of Gopher's head, showing the "pockets."

ADDRESS BY MR. HENRY H. LYMAN, MONTREAL.

GENTLEMEN.—Your President, or should I not rather say our President as I also am enrolled as a member of the North West (Canada) Entomological Society, has asked me to contribute a paper on the best means of furthering the aims of the Society, for the annual meeting.

Living so far east from the headquarters of the Society it is not easy to be fully aware of the conditions under which the work is carried on.

In our Montreal Branch of the Entomological Society of Ontario we have only about 20 members, but as all but one or two live in Montreal or the surrounding municipalities it is easy for us to get together, and we usually hold eight or nine monthly meetings during the winter season.

These meetings are generally held at the house of the President, but sometimes at the houses of other members or in the Natural History Museum. When held in private houses we generally have some refreshments, such as coffee and cake, or lemonade, etc., and social conversation after the adjournment of the meeting.

Probably the holding of such meetings would not be practicable in the case of the North West Society, on account of the members being too much scattered.

For myself, not being an agriculturist, I must confess that my interests lie more on the purely scientific side of the subject, but doubtless you are more interested in the practical side of the matter and desire to know how best to fight the insects which are always attacking your crops.

The first suggestion that I would make is that you should join the Entomological Society of Ontario as a branch, as the benefits to be derived from such union are very great as I think I can show you.

Membership in the Society only involves an annual subscription of one dollar per member, half of which sum is retained by the Branch for its own expenses, while the other half is transmitted to the head office at London, Ont. This, surely, is a very moderate subscription when the benefits received are considered, and I would now invite your consideration to those benefits. In the first place each member of the Branch becomes a full member of the Society with all the rights and privileges. Each member receives regularly the monthly journal of the Society, the Canadian Entomologist, which, though a highly scientific magazine, always contains something of interest even to the tyro. Each member also receives the Annual Report of the Society, and this will probably be the most important consideration to the majority of the members, especially as the value of this privilege has been greatly enhanced of recent years as Prof. James, the Deputy Minister of Agriculture of Ontario, has adopted the practice of sending to all members who are not in arrears a bound volume containing not only the Annual Report of the Entomological Society but also the Annual Report of the Fruit Growers' Association of Ontario and the Annual Report of the Fruit Experiment Stations of Ontario. The volume for 1898 recently distributed contained altogether 403 pages fully illustrated and of great interest and value to agriculturists and fruit growers.

And while the advantages of belonging to the larger society are so great there are no disadvantages. The North West Branch would be still as free as it is now to manage its own affairs, and would have the advantage of all this valuable and popular agricultural and scientific literature, and if this suggestion were adopted the membership of the Branch could be divided into honorary and regular.

As every year Dr. James Fletcher, the Entomologist and Botanist of the Experimental Farms, makes a trip through the Northwest Territories, I would suggest that if possible the Society should receive from him an annual lecture under the auspices of the Society.

One other suggestion that I should make is that those who make collections of insects or plants should be most particular in labeling them with the exact locality where obtained and date of capture or of blooming, as the case may be, and that those who do not regularly collect specimens should at least preserve specimens of those which are found troublesome, in order that they may be correctly determined, and also that they may be able to compare them with other and similar insects, so many species being easily confused with other forms, and that all observations of interest be invariably entered at the time in a note book, it not being safe to trust even to the best memory in such cases.

In regard to Botany I should say that this science is so closely connected with Entomology that every entomologist should be also a botanist, and every botanist might well be an entomologist also. The flowers of the North West are so beautiful that I should think that everyone must be charmed by them.

I had the pleasure of making a trip across the continent in 1890 and was simply delighted by the beauty of the wild flowers of the prairies. Though travelling rapidly, only stopping a day or two at a few of the principal points, I yet succeeded in making a very respectable collection of both the plants and butterflies of the region traversed, jumping off the train to gather plants at almost every stopping place along the line during the day time.

I regret that I am unable to meet with you at this the first annual meeting of the Society, but hope that you will have a very successful meeting, and if any of my suggestions are deemed worthy of adoption I shall be very glad.

With all good wishes I am,

faithfully yours,

HENRY H. LYMAN.

HENRY HERBERT LYMAN, M. A.

The portrait prefixed to this volume is that of Mr. Henry Herbert Lyman, of Montreal, who has just retired from the Presidency of the Entomological Society of Ontario. He was born at Montreal on the 21st of December, 1854, and was educated at the West End Academy and the High School, winning at the latter the Davidson medal. From school he proceeded to the McGill University and obtained his degree of B. A., with the distinction of being the Logan Medalist in Geology and Natural Sciences, in 1876; in due course he took his M. A. degree in 1880.

The year following his graduation at McGill (1877) he entered the business of Lymans, Clare & Co., wholesale druggists, in Montreal, of which his father was a principal partner; two years later the firm became Lyman, Sons & Co. Mr. H. H. Lyman is now senior partner in the firm and is also president of the Lyman Bros. & Co. (limited) of Toronto. These business houses are known throughout the length and breadth of the Dominion, and have always been distinguished for their upright dealing, energy and enterprise.

At the same time that he began his business career he joined the volunteers in Montreal; starting as an Ensign in the 5th battalion, now the Royal Scots of Canada, he gradually rose to be Major in 1885, with which rank he retired in 1891.

Though deeply engrossed in business and with much of his leisure taken up by his military duties, he yet found time to devote to his instinctive love for Natural History. When less than eight years old he began to take an interest in insects and to observe their ways, and when only twelve he started to form a collection, the precursor of what is now one of the finest collections of Lepidoptera in Canada. His first printed observations on insects appeared in the 6th volume of the *Canadian Entomologist* (1874), and shewed that even in those early days he was engaged in the rearing of butterflies and moths, a work to which he has largely devoted himself ever since. He has now contributed to eighteen out of the thirty-one volumes thus far published, and has also furnished useful and interesting papers to several of the Annual Reports of the Society. The value of his scientific work and attainments has been widely recognized. Since 1891 he has been a member of the Editing Committee of the *Canadian Entomologist*: in 1895 he was elected Vice-President of the Entomological Society of Ontario and continued to hold that position until his election as President in 1897. He held this highest place in the Society for two years to the great satisfaction of the members, and retired at the recen annual meeting. He is also a Vice-President of the Natural History Society of Montreal, in whose winter lectures he takes an active part; an associate member of the Cambridge Entomological Club; a corresponding member of the New York Entomological Society and of the United States National Geographic Society; an honorary member of the North-West (Canada) Entomological Society; Fellow of the Royal Colonial Institute, Member of Council of the British Empire League, and Member of both the British and American Associations for the Advancement of Science. He has also been for the last thirteen years President of the Montreal Branch of the Entomological Society of Ontario, and has done more than any other man to keep alive the enthusiasm of the members and encourage all who show any interest in the subject to persevere in the study and experience for themselves the joys of the ardent naturalist. During all these years nearly all the monthly meetings have been held at his house, and the members have greatly enjoyed his generous hospitality.

Mr. Lyman is a notable example of what a busy man can do. Though engrossed all day long with the duties and cares of a very extensive business, which demands, more perhaps than any other, a close attention to innumerable details, he yet finds time, not only for the pleasures of an energetic collector of insects, but also for the performance of much careful and conscientious scientific work. His published papers are valuable contributions to science, being always characterized by thorough accuracy of statement and shewing the results of painstaking and long-continued research.

C. J. S. B.

BOOK NOTICES.

GENERAL INDEX TO MISS ORMEROD'S REPORTS ON INJURIOUS INSECTS, 1877 to 1898.—By Robert Newstead, F.E.S. London: Simpkin, Marshall & Co. (Price 18 pence).

For twenty-one years Miss Ormerod has been issuing her valuable Reports of Observations on Injurious Insects, and in them has furnished a most useful mine of information regarding all the principal insects that that have been productive of injury in the British Isles during this long series of years. To render this mine readily available at any moment, a very satisfactory index has been prepared by Mr. Newstead. The greater part of it consists of a "General Index," in which reference is given to every insect treated of in the Reports under its scientific name, with reference also to habits, modes and subjects of attack, etc. This is followed by a "Plant Index," with reference to the insects attacking each; a similar "Animal Index," and a third comprising other matters attacked, such as bones and leather, seeds, etc.

We are glad to learn from her preface to the volume that Miss Ormerod is about to begin a second series of Reports in a somewhat different form. C. J. S. B.

FLASHLIGHTS ON NATURE.—By Grant Allen; illustrated by Frederick Enock. Toronto: William Briggs, 29 Richmond Street West. (Price 70 cents). pp. 312.

The late Mr. Grant Allen's versatility as a writer is well known, but whatever opinion may be formed regarding his novels and tales of fiction, there can be no question that few authors can be compared with him when he devoted himself to natural history subjects. His papers show that he must have been a most minute and painstaking student of the wonders of plant and animal life, while at the same time his literary skill enabled him to describe what he had seen and studied in a most charming manner and without any loss of scientific precision. He had also the able assistance of Mr. Enock, who is a well-known entomologist, and who evidently aided the author not only with his beautiful drawings but with his careful observations as well.

Most, if not all, of the papers in the volume before us have already appeared in the pages of a widely circulated magazine, but they are well worthy of reproduction in this more permanent and convenient form. They treat of insects, birds and plants, under such titles as the Cows that Ants Milk; a Plant that Melts Ice; a Beast of Prey (spider); a Woodland Tragedy (doings of a Butcher-bird); Marriage among the Clovers; the first Paper-maker, etc. The closing paper, a Foreign Invasion of England, gives an admirable description of the life-history of the Hessian-fly. The illustrations, about a hundred and forty in number, are very beautiful, and in clearness and excellence leave nothing to be desired. Anyone with a love of nature cannot fail to be delighted with the book and to derive a knowledge of many things that were secrets to him before. C. J. S. B.

OBITUARY.

On the 16th of October there passed away at Peterborough one of the original members of the Entomological Society of Ontario. The REV. VINCENT CLEMENTI, B.A., died at the age of eighty-seven years. He was a clergyman of the Church of England but had retired from active service some years ago in consequence of failing eye-sight and other infirmities. Born in England, the son of a famous musicial composer, U. Clementi, Esq., and educated at the University of Cambridge, he came to Canada in 1855 and settled in Peterborough. In 1863 he was appointed rector of Lakefield, where he remained for eleven years; he then became rector of Lindsay, and on his retirement returned to Peterborough to spend the rest of his days. He was an active member of the Masonic Society and rose to be Chaplain of the Grand Lodge of Ontario. In his younger days, and indeed throughout the whole of his life, he was devoted to natural history, horticulture and art, and was especially interested in entomology. He contributed occasionally to the early volumes of *The Canadian Entomologist*, and took a hearty interest in the welfare and success of the Society. His water colour drawings of insects were remarkable for their accuracy and beauty of execution. He was held in the highest respect and regard by all who knew him, and died a devout and upright man. C. J. S. B.

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THIRTY-FIRST ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1900.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
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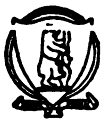

WARWICK BRO'S & RUTTER, PRINTERS.
TORONTO.

THIRTY-FIRST ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1900.

To the Honorable John Dryden, Minister of Agriculture :

Sir,—I have the honor to present herewith the thirty-first annual report of the Entomological Society of Ontario.

The thirty-seventh annual meeting of the Society was held in the City of London on the 13th and two following days of November, 1900, when the officers for the ensuing year were elected and the necessary business of the Society was transacted. The report of the proceedings includes the audited financial statement of the Treasurer and reports of the various branches, sections and officers of the Society; also the papers and addresses on various Entomological topics presented during the meetings.

The *Canadian Entomologist*, the Society's monthly magazine, has been regularly issued and is now completing its thirty-second volume. Its circulation in all parts of the world, and its value as a scientific publication have been well maintained.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

London, Ontario.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

OFFICERS FOR 1900 1901.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-seventh annual meeting of the Entomological Society of Ontario was held in London, the headquarters of the Society, on the 13th, 14th and 15th of November, 1900.

On Tuesday evening, the 13th, a joint meeting was held with the London Horticultural Society in a lecture room at the Normal School. Notwithstanding the inclemency of the weather, a snowstorm prevailing at the time, the hall was completely filled by a very appreciative audience, representing both Societies and the general public as well. The proceedings were much enlivened by instrumental and vocal musical selections kindly furnished by Miss Morphy and Mrs. Edna S. Robb, who was accompanied by Mr. J. W. Fetherston. The Horticultural Society is a new organization which has not yet completed its first year of existence, but has shewn itself to be full of energy and enterprise. Two very successful flower shows were held during the summer and several public meetings at which addresses were given on horticultural and kindred topics. The directors and officers are all members of the Entomological Society and so intimate are the relations between the two that the younger organization may be regarded as a section of the older and larger institution.

The chair was taken by MR. C. C. JAMES, Deputy Minister of Agriculture for Ontario, who delivered the opening address. He began by explaining the intimate relation that exists between horticulture and entomology, showing that we could have few fruits or flowers if there were no insects, and that there could be no insects if there were no vegetation. While many insects are most beneficial to fruits and flowers, other kinds are most destructive. As noxious or beneficial, the insect world has the closest possible connection with the vegetable kingdom. He then spoke of the various aspects of horticulture and referred, in the first place, to the *labor* side. In the sweat of the brow must the soil be cultivated; no good results can be obtained without hard work, but the earth responds most bountifully when well directed labour is bestowed upon it.

The next aspect is the *financial*. Horticulture must be profitable from a pecuniary point of view, otherwise there would not be so many professionally engaged in it. Their evident success and the expensive character of their equipment shows that they are providing for a real want of the community. All over the country there are extensive conservatories for the production of flowers, and here and there large nursery gardens for the supply of fruit trees and ornamental shrubs and plants.

But is there anything *intellectual* in horticulture? In the early days of this country the pioneer farmers devoted themselves exclusively to the raising of grain, and they began in the same way in Manitoba. All that they produced in excess of their own requirements was bartered for the necessary supplies of their families. After a time the care of cattle and pigs was added to the work of the farm and by degrees, after the lapse of many years, this department grew into the great live stock industry that we find to be so prosperous and so important to-day. The next development was the planting out of a few acres of apple trees and the addition in this way of an orchard to nearly every farm. The benefits derived from this improvement, both in the supply of a most wholesome and agreeable variety for the domestic table and the production of a lucrative crop, were soon realized; more and more land was given up to fruit culture, a higher taste was developed, a more lofty plane of life was reached. The monotonous routine of the early farmer's life was changed to one filled with variety as the seasons came and went, and men found that reading and knowledge were required for the successful prosecution of their varied pursuits. A further mark of progress was the adornment of the homestead with flowers and shrubs. The ornamentation of the home with these objects of natural beauty and the elevation of taste engendered by them indicated the highest stage of country life. The combination of all these things that have been referred to provides a

mode of life that cannot be dull and that requires a high degree of intelligence and ability for its successful prosecution.

Intellectual people, the speaker continued, are much inclined towards horticulture. When such retire with a competence from the business of life they usually find some place on the outskirts of a city or town where there is room for a garden, and there they enjoy their leisure in the cultivation of fruits and flowers. In proof of this devotion to gardening on the part of men who possessed the highest intellectual gifts, the speaker referred to several well-known authors. Blackmore, whose novels hold a place in the first rank, thought more of his fruits and flowers than he did of his books. Rider Haggard not long ago retired to an estate in England, and now he prefers to be spoken of as a farmer or gardener rather than as a writer of fiction. John Burroughs, the charming American writer, shows in his works his devotion to birds and flowers. Charles Dudley Warner lived for ten years in Hartford before he became popular, and then it was due to his papers as an amateur gardener published in the Hartford *Courier*. These attracted much attention and were published in book-form, with an introduction by Henry Ward Beecher, under the now well-known title "My Summer in a Garden."

The greatest Canadian historian is undoubtedly Francis Parkman. Though not a dweller in our country, he devoted himself to the study of its early annals and produced a series of works that cannot be too highly praised for the beauty of their style and the intense interest of their contents. His recently published biography deserves to be widely read; it shows that the great moral of his life was the surmounting of difficulties. Almost blind, crippled with rheumatism, prostrated with nervousness, without a really well day for twenty-five years, he yet managed to accomplish a vast amount of admirable literary work. At the early age of twenty-six he made an expedition along the famous "Oregon Trail" in the search for materials for a contemplated book. The hardships he then endured undermined his health and he was compelled to lay aside his literary work for a time. Horticulture became his exclusive pursuit for several years and by its aid he gradually regained his former health and vigour. He made the growing of roses and lilies his specialty, and at one time possessed a thousand varieties of roses and a great number of hybrids that he had obtained from lilies and other flowers. The meritorious character of his work was attested by his winning no less than 326 awards at the flower shows of the Massachusetts Horticultural Society. In 1871 he was actually appointed Professor of Horticulture by Harvard University and he held the position for a year. After that he returned to his literary pursuits and gained a reputation second to none as a painstaking, accurate historian of the romantic period of the early French regime in Canada.

Horticulture when broadly pursued is an education in itself; it requires undoubted powers of observation and induction, and as it demands intelligence, men of intelligence take a delight in it. It has also a *moral* aspect. Take the case of a boy—if he has a fondness for flowers and fruits, insects and birds, he cannot be an immoral person. His tastes are too high for that; his love for the beautiful things in nature raises him to a higher level and exalts his aspirations far above the sordid things of earth. Believing this to be the result, we can realize how important it is that space should be given in our School system for "Nature Study." It instinctively appeals to the hearts of all children, and by its cultivation leads them on to higher things and makes them better fitted to take their place with their fellows in later life—to do their duty more intelligently, more uprightly, towards their country, their neighbours, and at their own fireside.

THE PLANTING, CARE AND PRUNING OF THE TREES IN THE PARKS AND STREETS OF THE CITY.

By Mr. W. E. Saunders, of London.

The subject upon which I have to speak to you to-night is of great importance from every point of view, and while I only intend to touch upon certain phases, I feel sure the interest you have in the matter will lead you to follow it out in other lines also.

In nature, trees grow in one of two ways—either in a crowded forest, or in places or less open, where they get plenty of light. Although light is free to all, yet among the trees it is the only necessary for which they enter a great competitive struggle, upon which their very lives depend. When once started a tree cannot help getting a certain quantity of food and moisture, but unless it receives light also, it dies.

In the forest, trees grow as closely together as they can live, and there is a constant struggle to reach the top; those that succeed in doing so will spread out, and by shading the lower ones, kill them just as surely as though one cut them off with an axe. This method of growth shades the ground closely, keeping it damp and cool, and each year's crop of leaves buries beneath it as it falls the dead limbs and bark chips which fell during the summer and preceding winter, and these, kept always damp by this mulch of leaves, soon decay, and with the leaves themselves form what we know as leaf-mould, the whole process being nature's method of making fertile soil. This is the normal forest condition, and the product of its development is timber, straight-grained, strong and nearly knot-free wood, the joy of the carpenter's heart and one of the best gifts of the Creator to man.

But once in a while, in natural conditions, and more often when the agency of man is involved, a tree gets a chance to grow in a place where there is an abundance of light on all sides, and what result do we find? This tree, instead of growing tall as rapidly as possible, for fear that some competitor will cut off its supply of light, grows broad nearly as fast as it grows tall, and sometimes faster; all sides are covered with leaves, and all the branches beneath are draped with leaves in nature's own unequaled manner. Between these two styles of trees there is little resemblance; the shape is different, the leaves are all over, instead of merely at the top, while the wood, though equally good for burning, is so full of knots from the well developed limbs that it is nearly useless for lumber, but for beauty there is no comparison. The one shows nature in a creative mood making soil and timber for the use of generations yet unborn; and the other shows her in an artistic mood, and the product is something whose beauty is rarely, if ever, equaled by the artifice of man.

Scarcely can the dullest-minded person pass a beautiful tree without rendering his meed of admiration, and many of these growths are of such surpassing beauty that one is tempted to wonder if the Creator could possibly make anything finer, and yet so inscrutable are the ways of some men that they cut, maul, disfigure and distort these gifts of God, and they appear to think that He does not know how a tree should grow and that it is their duty to teach Him.

In our parks and city streets trees are grown mainly for purposes of shade and beauty, and as the coolest and most dense shade is given by the most beautiful trees, namely, those that are covered with leaves above, below and on all sides, it naturally follows that our city trees should be grown in this form. And there is but one way to grow them after this manner, and that is by giving them plenty of light, and keeping the trimming fiend at a distance.

In Victoria Park, young as it is, many trees are at this moment ugly and deformed by a want of observance of these conditions, light and trimming, and, in fact, one can see there some of the most striking examples of how not to grow a tree that can be found in a long journey. But it seems invidious to single out Victoria Park, when one can see in any part of the city glaring examples of distrust in the Creator's good taste and ability to grow a tree properly.

To many people who do their own pruning and do a good deal of it, the idea may not have occurred that nature really intended certain trees to grow in certain forms, and that no matter how they may be pruned, that form will always be the ultimate aim of the tree. They fail also to realize that the hand of God is omnipotent, and that their best endeavours will only mar the perfection of beauty into which a tree would come if permitted to follow its natural bent.

The love of trees is implanted deep in the nature of nearly every person. Many people do not realize this until they come into possession of a plot of ground, where a few trees are growing, when their natural affection comes quickly to the surface. But few, however, have this feeling so chastened with wisdom as to enable them to treat their trees well; nearly all want to grow two, three or even a dozen trees in the space that shodld be given to one, not realizing how much better it would be to have one fine, large, well-shaped, handsome tree, than to have half a dozen stunted, mis-shapen, lopsided ones, whose *only real utility is for con*sumption as fuel. No better proof of this deeply implanted love can be offered than the fact that it is almost impossible to persuade the average man to part with a single one of his trees, even when the destruction of one means the betterment of the others.

Occasionally, however, one sees a tree, even in London, that has had unlimited chance to develop, and the owners of these grand trees declare them to be without price; but these beautiful examples are all too few. The other extreme is everywhere, and perhaps the most flagrant case in London is in front of the Collegiate Institute. There stand three or four rows of trees, not one of which is now, or has any prospect of ever being anything but an eyesore, and yet those trees are old enough and have used enough nourishment from the soil and light from above to have made trees as handsome as any in the city had they been given proper opportunity. They are now so far gone that it would be almost impossible to make a really fine tree out of a single one of them; and what has occurred here is in process of occurring all over where from two to ten trees are planted in the space which one large, well-grown tree will need in twenty-five years.

At irregular intervals a man, called by courtesy a "tree-pruner," more or less authorized by those who rule over us to butcher every inanimate object, travels through our streets and makes a bad matter still worse.

A gentleman living near my house had last summer a very handsome cut-leaved birch and a good many maples growing on his front lawn. Noticing that the birch was beginning to suffer from being overcrowded, I one day complimented him on the beauty of his tree, and suggested that it needed more room in order to retain its beauty. He replied that it was a very nice tree, but it needed pruning, and he was getting a man who understood such things to come and see to it. The beauty of this species of birch lies in the long, slender, drooping branchlets, and in the handsome pyramidal shape of the tree; but this "pruner" sawed off the trunk of this tree at about eight feet from the top, sawed one-third off the larger limbs, and left the tree shorn of all its beauty and with the work of years destroyed. All the tree needed was to receive plenty of light and to be left alone. Such examples are abundant.

I notice lately that the tree pruner is getting in his deadly work at Springbank also. Within the past year or two the birches, poplars, maples, etc., near the pump-house have had from two to five feet taken off most of their branches, and from the trunk also. The object of this treatment is undiscoverable. The spruces, too, in other parts of the grounds, are receiving similar attention, and of all trees the spruce needs pruning least, and bears it worst. A pruned spruce is no longer a spruce, but an abortion, unlike anything in nature and is fit only for the brush pile, for it will never be itself again.

When trees are too many, cut some of them down. A tree which is too large for its environment can never be made handsome by any system of pruning, and not only that, it will spoil others which might be ornamental if its space were vacant.

Now, a word as to the planting of shade trees. In London we suffer from a superfluity of silver maple (Acer dasycarpum). This is a quick growing tree of handsome form, but there are others that are as quick growing and many that, though slow growers, are more desirable and very handsome. Our streets should not all be planted with one kind of tree. Monotony should be avoided. Besides, when a blighting disease or a devastating insect, affecting possibly only one species of tree, reaches a city planted with that tree only, that place is liable to have very few good trees left. Some twenty-five years ago the streets of London had many locust trees, whose foliage and flowers are both beautiful, but the locust borer came among them and now they are gone. The maple is a grand tree, hardy and nobly beautiful, but we have many other fine trees also, and doubtless it was never intended that we should confine ourselves to the use of one species only. The birches, three or four species of beautiful trees, immortalized in poetry and characteristic of the north; the lofty elm, whose fame as a street tree in New England has spread over the entire continent; the fragrant basswood, the evergreen spruces and cedar, the hemlock, which I sometimes think is the handsomest of all our trees, and the nut trees, chestnut, butternut, walnut, beech and the hickories—all these and many more have beauties of their own, and should be largely used, particularly the nut class, which render the parks attractive to the squirrels and the birds and the children, and is it not for the children, particularly *those of the po*orer people, for whose use the parks should mainly exist? I have no pati*ence with the park regulations* which say to the children, "Keep off the Grass." Rather let them say, "Boys and girls, this park is for you; don't destroy it, but enjoy it in every possible way." Some day I hope we shall see this principle recognized.

Beauty in the streets and parks is an asset, and should be well looked after, as it is perhaps the greatest attraction a city can have, next to a low tax rate; and although we have to-day many thousands of spoiled, ugly trees, fit only for the woodpile, yet there are thousands more growing up, and intelligent care can prevent most of them from following the example set by their elders.

These points upon which I have touched affect not only our own city, but almost every city and town in our country; and the need for intelligent care is urgent.

It was only a few weeks ago that an eminent horticulturist wrote in the pages of *Gardening*, a leading American magazine, of the folly of planting trees in rows along the drives in parks, a method which is the worst possible, for besides spoiling the artistic appearance of the place, it prevents the people on the drives from the realization and the enjoyment of the beauties of either the nearby or the distant view, and yet, despite of the fact that this principle is freely stated and admitted by the best authorities, it is the very method which is being adopted in our river park, now in process of formation; and not only that, but the chief part of the trees planted have been soft maples and Norway spruces, the very ones of which Londoners have already far too many. It is to be hoped that ere long different methods may prevail, and while there is yet time the best may be made of the material now planted, and that the future may be properly provided for by the planting of such trees as will lend variety and beauty to the landscape. How this is to be accomplished is not difficult to tell, for it can only be done by placing the control of such matters in the hands of men who have given thought and study to the subject. Were our own city council, for instance, to appoint for 1901 a committee consisting of a few such men, and to give them a free hand in the matter the effect on the appearance of our city parks and streets would be great and lasting.

I have not touched upon the matter of shrubs and flowering plants, but it would be easy to make a great improvement over present conditions were the plan above mentioned to come into action, and no plan would be complete that did not aim at the best results in these points, as well as others; but a shrub may be at its best in five or ten years, whereas a tree is the growth of decades, and neglect for ten years may ruin the result of twenty-five years' careful work and thought.

Dr. **James Fletcher**, Dominion Entomologist and Botanist, Experimental Farms, Ottawa, was the next speaker. His address was illustrated with beautiful lantern pictures, which gave great pleasure to the audience. The excellent lantern was kindly provided by Mr. Merchant, Principal of the Normal School, who was assisted in its manipulation by Mr. R. W. Rennie.

Dr. Fletcher first presented a series of pictures in illustration of the paper that had just been read by Mr. Saunders and showed how trees should be grown and treated, giving as examples specimens that were growing on the Experimental Farms at Ottawa and in the North-West. Many of these were from photographs taken on the grounds of the Experimental Farm at Ottawa, and had been specially lent for the occasion by Dr. William Saunders, the Director. Among others he exhibited the Black Walnut, Russian Poplar, Austrian Pine, Blue Spruce, Scotch Pine, Cutleafed Birch, and some very remarkable trees in the Rocky Mountains and in British Columbia; he also showed some beautiful flowering shrubs and other interesting plants, the Hydrangea paniculata grandiflora, Spiræa van Houtei, Mary Arnott Rose, Charles X Lilac, Cypripedium spectabile, etc.; the Devil's Club (a most troublesome plant to mountain climbers), Hedges on the North-West Experimental Farms, Dr. Saunders's Hybrids from Apple and Pyrus baccata; the method of spraying trees at Ottawa.

He then took up the subject of insects, showing how those that are injurious may be divided into two great classes according to the mode in which they partake of their food, namely the biting (those furnished with jaws) such as caterpillars, grubs, beetles, &c., and the sucking (those provided with a beak or sucker), such as mosquitoes, aphides, bugs, &c. The former can be destroyed by poisoning their food with such substances as Paris green, hellebore, insect-powder, &c., but the latter cannot be reached in this way, and must be subdued by substances that will smother them when applied to their bodies, viz., kerosene emulsion, whale-oil soap, &c. The many beneficial species of insects, such as lady-birds, ichneumons, carnivorous ground-beetle, which prey upon cut-worms, and many others, ought to be familiar to all, so that they should not be wantonly trodden under foot or otherwise destroyed. Excellent figures of all those referred to were shewn upon the screen, and a large number of our most prevalent insect pests, among others, the cabbage-root maggot, the devastating and climbing cut-worms, the May beetle (white grub), pea-weevil and pea-aphis, pear psylla, eye-spotted bud-moth, canker and palmer worms, the cigar case-bearer, plum sphinx and curculio, grape-vine flea beetle, spruce gall-louse, tent caterpillars, codling moth, San José scale, and the lovely Luna moth. Each picture as it appeared was briefly described in the speaker's well-known graphic and often humorous manner, and the interest and attention of the large audience were maintained to the last.

At the close of Dr. Fletcher's address, the following resolution was proposed by Dr. Bethune, who spoke briefly in its support, and seconded by Principal Kirk; on being put to the meeting, it was unanimously adopted:

"That this meeting of the Horticultural and Entomological Societies endorses the idea that the control of the city's horticulture should be in the hands of men who have made this science a study; and that this meeting urges upon the City Council the advisability of placing in the hands of a small committee of citizens the entire control of the shade trees on the streets and in the parks of London, believing that in this way only can the best results be accomplished; and that the secretaries of the two societies are hereby instructed to send copies of this resolution to the Mayor and the City Clerk early in January, 1901, asking that it be brought before the Council at the earliest possible moment, and requesting that action be taken thereon."

At the conclusion, votes of thanks were tendered to the ladies for the musical treat that they had afforded; Professor James and the other speakers for their interesting addresses; Professor Lochhead, for the loan of a number of slides; and Principal Merchant, for the use of the Lecture room and lantern, and the kind assistance that he and Mr. Rennie had afforded.

WEDNESDAY, NOVEMBER 14TH.

The Council of the Entomological Society met at 10.30 a.m., for the transaction of business and the preparation of their report on the proceedings of the past year. The President occupied the chair, and the meeting continued in session till one o'clock.

The Society met at 2.30 p.m. Among those present were the following: Rev. Dr. Fyles, South Quebec, President; Prof. Lochhead, Ontario Agricultural College, Vice-President; Dr. James Fletcher and Mr. Arthur Gibson, Experimental Farm, Ottawa; Mr. Henry H. Lyman, Montreal; Inspector G. E. Fisher, Freeman, Ont.; Prof. F. M. Webster, Wooster, Ohio; Revs. Provost Watkins, and Dr. Bethune, London; Drs. Woolverton and Stevenson, and Messrs. J. A. Balkwill, J. H. Bowman, J. Dearness, H. Gould, B. Green, C. J. Fox, W. Gammage, W. H. Hamilton, John Law, Heard, J. A. Moffat, S. B. McCready, W. E. Saunders, R. W. Rennie, E. A. Brown, H. S. Saunders, and many other residents of London.

The President called upon the Directors and Officers of the Society, the representatives of the Branches, and the chairmen of the Sections for their respective Reports on the work of the past year. These were read and discussed, as follows:

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its Annual Report for the years 1899-1900.

The thirty-sixth annual meeting was held in London in October 1899, and was well attended by members from a distance as well as by those resident in the city. An interesting and important addition to the ordinary proceedings was a conference held during the first afternoon on the San José Scale and the operations that had been carried out for its suppression in the Province of Ontario. A full report of the discussion and of the subsequent proceedings at the meeting has already been published; it is therefore unnecessary to enter into particulars.

The thirtieth Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in December last and was printed and distributed in the following March. It contained 127 pages and was illustrated with sixty-six wood cuts and two plates, one a portrait of Mr. Henry H. Lyman the retiring President, the other exhibiting the structure of a butterfly's wing. Besides the account of the conference on the San José Scale and the proceedings at the Annual Meeting, it contained among many useful papers, the President's address by Mr. Lyman; "One hundred years of American Entomology" and "The home of the San José Scale" by Prof. F. M. Webster; papers by Prof. Lochhead, Mr. Arthur Gibson, Mr. J. A. Moffat, Dr. Bethune, Mr. W. N. Hutt, Dr. Fyles, and articles on the most notable and injurious insects of the year by Dr. Fletcher, Messrs. Harrington, Evans, Moffat, Gibson and Drs. Fyles and Bethune. An addition of much interest was the report of the proceedings at the first annual meeting of the North-West (Canada) Entomological Society, held at Lacombe, Alberta, in November 1899.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 31st volume was completed in December last; it consisted of 377 pages, illustrated with 36 wood cuts and six plates. The contributors numbered no less than sixty, and included well-known writers in England, Germany, Finland, Brazil and Japan, as well as in the United States and Canada. The thirty-second volume will be completed next month; the eleven numbers already issued contain 352 pages and many original illustrations.

An index to the thirty Annual Reports of the Society, 1870 to 1899, has been prepared by the Rev. Dr. Bethune and is now being printed under the direction of the Department of Agriculture. It is expected to be ready for distribution before the end of the year, and will, undoubtedly, be found of very great value by all who have occasion to consult these Reports.

Entomological meetings have been held regularly on Friday evenings, at first fortnightly, afterwards weekly, from October to June, and have now been resumed for the autumn and winter seasons. The study of the Lepidoptera was taken up for several months and when spring opened specimens freshly captured were brought for identification and discussion. The order Coleoptera has been adopted for study during the sessions that have now begun.

The Council is glad to be able to report that the Ornithological Section has been revived and has held regular monthly meetings for a year past; at the same time it has to express its regret that no meetings of the Botanical Section have been held this year. The Geological Section has been as active as usual, holding weekly meetings on Tuesday evenings throughout the greater part of the year, and the Microscopical Section has held interesting meetings on alternate Friday evenings during the autumn and winter months.

Many valuable and interesting additions have been made to the Library and Collections. The Council desires to bear its testimony to the great care taken by Mr. Moffat in the preservation of the Society's books and specimens, and their neat and orderly arrangement. Too much praise cannot be accorded to him for the zeal and interest that he always displays in attending to the welfare of the Society and the good order of its property.

All of which is respectfully submitted.

THOMAS. W. FYLES, President.

REPORT OF THE LIBRARIAN AND CURATOR, FOR THE YEAR ENDING 31ST OF AUGUST, 1900.

Thirty bound volumes of Government Reports, and proceedings and transactions of societies were received during the year. Among them were twelve quarto volumes of the United States Geological Survey, profusely illustrated, with a volume of maps accompanying them.

Thirty-four volumes were bound and added to the library. Among these are some volumes of the Bulletins of the Iowa University (a gift to the library by Rev. Dr. Bethune) one of which is of special interest, being explorations in the Canadian Far North in search of the Musk Ox, by Frank Russell. Also contributions from Drs. Fletcher and Bethune of volumes of the Proceedings of the American Association for the Advancement of Science, which complete the Society's set up to date, and make the number of volumes added during the year 64.

The full number now on the register is 1,691.

Number of volumes issued to local members was 45.

A few additional specimens of Manitoba Lepidoptera have been secured since the last report, which are valuable for reference and comparison.

Nothing of special interest in local captures can be reported for the past season. A few doubtful forms are awaiting determination. Mr. O. C. Poling, of Quincy, Illinois, has kindly and considerately presented to the Societv, a fine pair of that rare, singular and interesting butterfly, *Neophasia Terlootii*, Behr., taken in Arizona.

Respectfully submitted.

J. ALSTON MOFFAT.

AUDITORS' REPORT.

Receipts and Expenditures of the Entomological Society of Ontario, for the year ending August 31st, 1900:

RECEIPTS.		EXPENDITURES.	
Balance, September 1st, 1899	$ 576.30	Cork, pins, etc	$ 45.20
Sales of Entomologist	150.69	Expense acct.,(Postage, etc.)	159.79
Sales of Cork, pins, etc	93.58	Library	35 89
Advertising	14 35	Salaries	375.00
Government Grant	1,000.00	Annual Meeting and Report	254.60
Members fees	439 86	Rent	175 00
Interest	13.16	Printing	749 75
		Balance on hand Aug. 31st, 1900,	492.71
	$2,287.94		$2,287.94

We, the Auditors of the Entomological Society of Ontario hereby certify that we have examined the books and vouchers of the Treasurer and find them correct, and that the above is a true statement of the accounts of the society.

W. H. HAMILTON } Auditors.
JAS. H. BOWMAN }

London, Ont., Sept. 18th, 1900.

REPORT OF THE MONTREAL BRANCH.

The 224th Regular and 27th Annual Meeting of the Montreal Branch of the Entomological Society of Ontario was held at 74 McTavish street on Tuesday evening, May 8th, 1900.

The members present comprised Messrs. A. F. Winn (Pres.), Henry H. Lyman, A. E. Norris, E. T. Chambers, J. C. Williams, G. Chagnon, G. Beaulieu, M. W. Davis, C. Stevenson, G. A. Moore, C. P. Newman and L. Gibb. Visitor—Rev. E C. Trenholme.

The chair was taken by the President and the minutes of the previous meeting, and also of the last annual meeting, were read and confirmed.

REPORT OF THE COUNCIL.

The President then submitted the following report of the Council for the past year:

In presenting their report for the past year your Council is pleased to be able to state that much good work has been done.

Eight regular monthly meetings have been held, the average attendance being ten, and six new members have been added to our roll.

We have again had a visit from each of our good friends, Dr. Fletcher and Rev. Dr. Fyles, in addition we had the pleasure of having Mr. J. G. Jack of Jamaica Plains, Mass., at one meeting and one of our new members, Mr. E. D. Wintle of Como, P.Q., has come to our meetings regularly.

Two field days were held, the first at Beloeil Mountain, St. Hilaire, on May 24, *which was very successful*, many valuable specimens being secured; the other at Chateauguay on July 1st was made a most enjoyable outing, through the kind hospitality of Mr. and Mrs. Jack and their family, but the captures were disappointing owing to the strong wind which was blowing all day. Several members also attended the Natural History Society's field day at Montford.

The following papers were read at the meetings:

Retiring Address of the President—Henry H. Lyman.
Collecting at Electric Light—A. F. Winn.
Note on Emergence of Telea polyphemus—M. W. Davis.
The Genus Hydroecia—Dwight Brainerd.
Spiders—Rev. Dr. Fyles.
A Sketch of the Order Orthoptora—E. M. Walker (of the Toronto Branch).
Tribulations of a Beginner—Dwight Brainerd.
Practical Entomology, or Bee Keeping—Gilbert Wintle.
Bees and Wasps—Dr. Jas. Fletcher.
An Entomological Muddle—Henry H. Lyman.
Chrysophanus thoe—A. F. Winn.
On the Rearing of Lepidoptera—Arthur Gibson.
Danais Archippus—A. E. Norris.

This list probably shows more diversity of subjects than that of any year in the history of the Branch, and the specimens shown at the meetings have included orders that have been little studied here in the past, such as Diptera, Hymenoptera and Orthoptera.

Our collection of books has again been added to by Mr. J. G. Jack, who has presented copies of the report on the Gypsy Moth and two volumes of Memoirs of the Academy of Natural Sciences. A case has been ordered for our books and pamphlets, and the Natural History Society have kindly consented to give us space for it in their building.

The Treasurer's statement shows the Branch to be in a good financial position.

Respectfully submitted on behalf of the Council,

Albert F. Winn, President.

The Treasurer then submitted his report, showing a balance on hand of $59.37.

It was moved by Mr. H. H. Lyman and seconded by Mr. C. Stevenson "That the reports of the Council and of the Treasurer be received and adopted." Carried.

The following officers were elected for the ensuing year: President, A. F. Winn; Vice-President, Dwight Brainerd; Secretary, Lachlan Gibb; Treasurer, M. Waring Davis; Librarian, A. E. Norris; Council, H. H. Lyman and G. Chagnon.

Mr. Henry H. Lyman read a paper on the Life History of Euchaetes Oregonensis, and also exhibited a pamphlet entitled Memoirs of the Chicago Entomological Society.

A letter was read from E. Brunetti, London, England, asking for exchange in Canadian Diptera, which was referred to Mr. Chagnon.

After examining a number of specimens shown by the members the meeting adjourned.

Lachlan Gibb, Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec branch of the Entomological Society of Ontario was held on May 12th, 1900, the president, Rev. Dr. Fyles, occuping the chair.

President's Address.

The Quebec branch of the Entomological Society of Ontario has entered upon the fourth year of its existence. During the past year several things have happened to occasion our members much concern.

Death has removed two from amongst us. Mrs. Treffry departed this life a few months ago; and on April 27th, Mr. Treffry after a very brief illness was also taken

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-seventh annual meeting of the Entomological Society of Ontario was held in London, the headquarters of the Society, on the 13th, 14th and 15th of November, 1900.

On Tuesday evening, the 13th, a joint meeting was held with the London Horticultural Society in a lecture room at the Normal School. Notwithstanding the inclemency of the weather, a snowstorm prevailing at the time, the hall was completely filled by a very appreciative audience, representing both Societies and the general public as well. The proceedings were much enlivened by instrumental and vocal musical selections kindly furnished by Miss Morphy and Mrs. Edna S. Robb, who was accompanied by Mr. J. W. Fetherston. The Horticultural Society is a new organization which has not yet completed its first year of existence, but has shewn itself to be full of energy and enterprise. Two very successful flower shows were held during the summer and several public meetings at which addresses were given on horticultural and kindred topics. The directors and officers are all members of the Entomological Society and so intimate are the relations between the two that the younger organization may be regarded as a section of the older and larger institution.

The chair was taken by MR. O. C. JAMES, Deputy Minister of Agriculture for Ontario, who delivered the opening address. He began by explaining the intimate relation that exists between horticulture and entomology, showing that we could have few fruits or flowers if there were no insects, and that there could be no insects if there were no vegetation. While many insects are most beneficial to fruits and flowers, other kinds are most destructive. As noxious or beneficial, the insect world has the closest possible connection with the vegetable kingdom. He then spoke of the various aspects of horticulture and referred, in the first place, to the *labor* side. In the sweat of the brow must the soil be cultivated; no good results can be obtained without hard work, but the earth responds most bountifully when well directed labour is bestowed upon it.

The next aspect is the *financial.* Horticulture must be profitable from a pecuniary point of view, otherwise there would not be so many professionally engaged in it. Their evident success and the expensive character of their equipment shows that they are providing for a real want of the community. All over the country there are extensive conservatories for the production of flowers, and here and there large nursery gardens for the supply of fruit trees and ornamental shrubs and plants.

But is there anything *intellectual* in horticulture? In the early days of this country the pioneer farmers devoted themselves exclusively to the raising of grain, and they began in the same way in Manitoba. All that they produced in excess of their own requirements was bartered for the necessary supplies of their families. After a time the care of cattle and pigs was added to the work of the farm and by degrees, after the lapse of many years, this department grew into the great live stock industry that we find to be so prosperous and so important to-day. The next development was the planting out of a few acres of apple trees and the addition in this way of an orchard to nearly every farm. The benefits derived from this improvement, both in the supply of a most wholesome and agreeable variety for the domestic table and the production of a lucrative crop, were soon realized; more and more land was given up to fruit culture, a higher taste was developed, a more lofty plane of life was reached. The monotonous routine of the early farmer's life was changed to one filled with variety as the seasons came and went, and men found that reading and knowledge were required for the successful prosecution of their varied pursuits. A further mark of progress was the adornment of the homestead with flowers and shrubs. The ornamentation of the home with these objects of natural beauty and the elevation of taste engendered by them indicated the highest stage of *country life. The combination of* all these things that have been referred to provides a mode of life that cannot be dull and that requires a high degree of intelligence and ability for its successful prosecution.

Intellectual people, the speaker continued, are much inclined towards horticulture. When such retire with a competence from the business of life they usually find some place on the outskirts of a city or town where there is room for a garden, and there they enjoy their leisure in the cultivation of fruits and flowers. In proof of this devotion to gardening on the part of men who possessed the highest intellectual gifts, the speaker referred to several well-known authors. Blackmore, whose novels hold a place in the first rank, thought more of his fruits and flowers than he did of his books. Rider Haggard not long ago retired to an estate in England, and now he prefers to be spoken of as a farmer or gardener rather than as a writer of fiction. John Burroughs, the charming American writer, shows in his works his devotion to birds and flowers. Charles Dudley Warner lived for ten years in Hartford before he became popular, and then it was due to his papers as an amateur gardener published in the Hartford *Courier*. These attracted much attention and were published in book-form, with an introduction by Henry Ward Beecher, under the now well-known title "My Summer in a Garden."

The greatest Canadian historian is undoubtedly Francis Parkman. Though not a dweller in our country, he devoted himself to the study of its early annals and produced a series of works that cannot be too highly praised for the beauty of their style and the intense interest of their contents. His recently published biography deserves to be widely read; it shows that the great moral of his life was the surmounting of difficulties. Almost blind, crippled with rheumatism, prostrated with nervousness, without a really well day for twenty-five years, he yet managed to accomplish a vast amount of admirable literary work. At the early age of twenty-six he made an expedition along the famous "Oregon Trail" in the search for materials for a contemplated book. The hardships he then endured undermined his health and he was compelled to lay aside his literary work for a time. Horticulture became his exclusive pursuit for several years and by its aid he gradually regained his former health and vigour. He made the growing of roses and lilies his specialty, and at one time possessed a thousand varieties of roses and a great number of hybrids that he had obtained from lilies and other flowers. The meritorious character of his work was attested by his winning no less than 326 awards at the flower shows of the Massachusetts Horticultural Society. In 1871 he was actually appointed Professor of Horticulture by Harvard University and he held the position for a year. After that he returned to his literary pursuits and gained a reputation second to none as a painstaking, accurate historian of the romantic period of the early French regime in Canada.

Horticulture when broadly pursued is an education in itself; it requires undoubted powers of observation and induction, and as it demands intelligence, men of intelligence take a delight in it. It has also a *moral* aspect. Take the case of a boy—if he has a fondness for flowers and fruits, insects and birds, he cannot be an immoral person. His tastes are too high for that; his love for the beautiful things in nature raises him to a higher level and exalts his aspirations far above the sordid things of earth. Believing this to be the result, we can realize how important it is that space should be given in our School system for "Nature Study." It instinctively appeals to the hearts of all children, and by its cultivation leads them on to higher things and makes them better fitted to take their place with their fellows in later life—to do their duty more intelligently, more uprightly, towards their country, their neighbours, and at their own fireside.

THE PLANTING, CARE AND PRUNING OF THE TREES IN THE PARKS AND STREETS OF THE CITY.

By Mr. W. E. Saunders, of London.

The subject upon which I have to speak to you to-night is of great importance from every point of view, and while I only intend to touch upon certain phases, I feel sure the interest you have in the matter will lead you to follow it out in other lines also.

In nature, trees grow in one of two ways—either in a crowded forest, or in places or less open, where they get plenty of light. Although light is free to all, yet among the trees it is the only necessary for which they enter a great competitive struggle, upon which their very lives depend. When once started a tree cannot help getting a certain quantity of food and moisture, but unless it receives light also, it dies.

In the forest, trees grow as closely together as they can live, and there is a constant struggle to reach the top; those that succeed in doing so will spread out, and by shading the lower ones, kill them just as surely as though one cut them off with an axe. This method of growth shades the ground closely, keeping it damp and cool, and each year's crop of leaves buries beneath it as it falls the dead limbs and bark chips which fell during the summer and preceding winter, and these, kept always damp by this mulch of leaves, soon decay, and with the leaves themselves form what we know as leaf-mould, the whole process being nature's method of making fertile soil. This is the normal forest condition, and the product of its development is timber, straight-grained, strong and nearly knot-free wood, the joy of the carpenter's heart and one of the best gifts of the Creator to man.

But once in a while, in natural conditions, and more often when the agency of man is involved, a tree gets a chance to grow in a place where there is an abundance of light on all sides, and what result do we find? This tree, instead of growing tall as rapidly as possible, for fear that some competitor will cut off its supply of light, grows broad nearly as fast as it grows tall, and sometimes faster; all sides are covered with leaves, and all the branches beneath are draped with leaves in nature's own unequaled manner. Between these two styles of trees there is little resemblance; the shape is different, the leaves are all over, instead of merely at the top, while the wood, though equally good for burning, is so full of knots from the well developed limbs that it is nearly useless for lumber, but for beauty there is no comparison. The one shows nature in a creative mood making soil and timber for the use of generations yet unborn; and the other shows her in an artistic mood, and the product is something whose beauty is rarely, if ever, equaled by the artifice of man.

Scarcely can the dullest-minded person pass a beautiful tree without rendering his meed of admiration, and many of these growths are of such surpassing beauty that one is tempted to wonder if the Creator could possibly make anything finer, and yet so inscrutable are the ways of some men that they cut, maul, disfigure and distort these gifts of God, and they appear to think that He does not know how a tree should grow and that it is their duty to teach Him.

In our parks and city streets trees are grown mainly for purposes of shade and beauty, and as the coolest and most dense shade is given by the most beautiful trees, namely, those that are covered with leaves above, below and on all sides, it naturally follows that our city trees should be grown in this form. And there is but one way to grow them after this manner, and that is by giving them plenty of light, and keeping the trimming fiend at a distance.

In Victoria Park, young as it is, many trees are at this moment ugly and deformed by a want of observance of these conditions, light and trimming, and, in fact, one can see there some of the most striking examples of how not to grow a tree that can be found in a long journey. But it seems invidious to single out Victoria Park, when one can see in any part of the city glaring examples of distrust in the Creator's good taste and ability to grow a tree properly.

To many people who do their own pruning and do a good deal of it, the idea may not have occurred that nature really intended certain trees to grow in certain forms, and that no matter how they may be pruned, that form will always be the ultimate aim of the tree. They fail also to realize that the hand of God is omnipotent, and that their best endeavours will only mar the perfection of beauty into which a tree would come if permitted to follow its natural bent.

The love of trees is implanted deep in the nature of nearly every person. Many people do not realize this until they come into possession of a plot of ground, where a few trees are growing, when their natural affection comes quickly to the surface. But few, however, have this feeling so chastened with wisdom as to enable them to treat their trees well; nearly all want to grow two, three or even a dozen trees in the space that shodld be given to one, not realizing how much better it would be to have one fine, large, well-shaped, handsome tree, than to have half a dozen stunted, mis-shapen, lopsided ones, whose *only real utility is for* consumption as fuel. No better proof of this deeply implanted love can be offered than the fact that it is almost impossible to persuade the average man to part with a single one of his trees, even when the destruction of one means the betterment of the others.

Occasionally, however, one sees a tree, even in London, that has had unlimited chance to develop, and the owners of these grand trees declare them to be without price; but these beautiful examples are all too few. The other extreme is everywhere, and perhaps the most flagrant case in London is in front of the Collegiate Institute. There stand three or four rows of trees, not one of which is now, or has any prospect of ever being anything but an eyesore, and yet those trees are old enough and have used enough nourishment from the soil and light from above to have made trees as handsome as any in the city had they been given proper opportunity. They are now so far gone that it would be almost impossible to make a really fine tree out of a single one of them; and what has occurred here is in process of occurring all over where from two to ten trees are planted in the space which one large, well-grown tree will need in twenty-five years.

At irregular intervals a man, called by courtesy a "tree-pruner," more or less authorized by those who rule over us to butcher every inanimate object, travels through our streets and makes a bad matter still worse.

A gentleman living near my house had last summer a very handsome cut-leaved birch and a good many maples growing on his front lawn. Noticing that the birch was beginning to suffer from being overcrowded, I one day complimented him on the beauty of his tree, and suggested that it needed more room in order to retain its beauty. He replied that it was a very nice tree, but it needed pruning, and he was getting a man who understood such things to come and see to it. The beauty of this species of birch lies in the long, slender, drooping branchlets, and in the handsome pyramidal shape of the tree; but this "pruner" sawed off the trunk of this tree at about eight feet from the top, sawed one-third off the larger limbs, and left the tree shorn of all its beauty and with the work of years destroyed. All the tree needed was to receive plenty of light and to be left alone. Such examples are abundant.

I notice lately that the tree pruner is getting in his deadly work at Springbank also. Within the past year or two the birches, poplars, maples, etc, near the pump-house have had from two to five feet taken off most of their branches, and from the trunk also. The object of this treatment is undiscoverable. The spruces, too, in other parts of the grounds, are receiving similar attention, and of all trees the spruce needs pruning least, and bears it worst. A pruned spruce is no longer a spruce, but an abortion, unlike anything in nature and is fit only for the brush pile, for it will never be itself again.

When trees are too many, cut some of them down. A tree which is too large for its environment can never be made handsome by any system of pruning, and not only that, it will spoil others which might be ornamental if its space were vacant.

Now, a word as to the planting of shade trees. In London we suffer from a superfluity of silver maple (Acer dasycarpum). This is a quick growing tree of handsome form, but there are others that are as quick growing and many that, though slow growers, are more desirable and very handsome. Our streets should not all be planted with one kind of tree. Monotony should be avoided. Besides, when a blighting disease or a devastating insect, affecting possibly only one species of tree, reaches a city planted with that tree only, that place is liable to have very few good trees left. Some twenty-five years ago the streets of London had many locust trees, whose foliage and flowers are both beautiful, but the locust borer came among them and now they are gone. The maple is a grand tree, hardy and nobly beautiful, but we have many other fine trees also, and doubtless it was never intended that we should confine ourselves to the use of one species only. The birches, three or four species of beautiful trees, immortalized in poetry and characteristic of the north; the lofty elm, whose fame as a street tree in New England has spread over the entire continent; the fragrant basswood, the evergreen spruces and cedar, the hemlock, which I sometimes think is the handsomest of all our trees, and the nut trees, chestnut, butternut, walnut, beech and the hickories—all these and many more have beauties of their own, and should be largely used, particularly the nut class, which render the parks attractive to the squirrels and the birds and the children, and is it not for the children, particularly those of the poorer people, for whose use the parks should mainly exist? I have no patience with the park regulations which say to the children, "Keep off the Grass." Rather let them say, "Boys and girls, this park is for you; don't destroy it, but enjoy it in every possible way." Some day I hope we shall see this principle recognized.

Beauty in the streets and parks is an asset, and should be well looked after, as it is perhaps the greatest attraction a city can have, next to a low tax rate; and although we have to-day many thousands of spoiled, ugly trees, fit only for the woodpile, yet there are thousands more growing up, and intelligent care can prevent most of them from following the example set by their elders.

These points upon which I have touched affect not only our own city, but almost every city and town in our country; and the need for intelligent care is urgent.

It was only a few weeks ago that an eminent horticulturist wrote in the pages of *Gardening*, a leading American magazine, of the folly of planting trees in rows along the drives in parks, a method which is the worst possible, for besides spoiling the artistic appearance of the place, it prevents the people on the drives from the realization and the enjoyment of the beauties of either the nearby or the distant view, and yet, despite of the fact that this principle is freely stated and admitted by the best authorities, it is the very method which is being adopted in our river park, now in process of formation; and not only that, but the chief part of the trees planted have been soft maples and Norway spruces, the very ones of which Londoners have already far too many. It is to be hoped that ere long different methods may prevail, and while there is yet time the best may be made of the material now planted, and that the future may be properly provided for by the planting of such trees as will lend variety and beauty to the landscape. How this is to be accomplished is not difficult to tell, for it can only be done by placing the control of such matters in the hands of men who have given thought and study to the subject. Were our own city council, for instance, to appoint for 1901 a committee consisting of a few such men, and to give them a free hand in the matter the effect on the appearance of our city parks and streets would be great and lasting.

I have not touched upon the matter of shrubs and flowering plants, but it would be easy to make a great improvement over present conditions were the plan above mentioned to come into action, and no plan would be complete that did not aim at the best results in these points, as well as others; but a shrub may be at its best in five or ten years, whereas a tree is the growth of decades, and neglect for ten years may ruin the result of twenty-five years' careful work and thought.

Dr. **James Fletcher**, Dominion Entomologist and Botanist, Experimental Farms, Ottawa, was the next speaker. His address was illustrated with beautiful lantern pictures, which gave great pleasure to the audience. The excellent lantern was kindly provided by Mr. Merchant, Principal of the Normal School, who was assisted in its manipulation by Mr. R. W. Rennie.

Dr. Fletcher first presented a series of pictures in illustration of the paper that had just been read by Mr. Saunders and showed how trees should be grown and treated, giving as examples specimens that were growing on the Experimental Farms at Ottawa and in the North-West. Many of these were from photographs taken on the grounds of the Experimental Farm at Ottawa, and had been specially lent for the occasion by Dr. William Saunders, the Director. Among others he exhibited the Black Walnut, Russian Poplar, Austrian Pine, Blue Spruce, Scotch Pine, Cutleafed Birch, and some very remarkable trees in the Rocky Mountains and in British Columbia; he also showed some beautiful flowering shrubs and other interesting plants, the Hydrangea paniculata grandiflora, Spiræa van Houtei, Mary Arnott Rose, Charles X Lilac, Cypripedium spectabile, etc.; the Devil's Club (a most troublesome plant to mountain climbers), Hedges on the North-West Experimental Farms, Dr. Saunders's Hybrids from Apple and Pyrus baccata; the method of spraying trees at Ottawa.

He then took up the subject of insects, showing how those that are injurious may be divided into two great classes according to the mode in which they partake of their food, namely the biting (those furnished with jaws) such as caterpillars, grubs, beetles, &c., and the sucking (those provided with a beak or sucker), such as mosquitoes, aphides, bugs, &c. The former can be destroyed by poisoning their food with such substances as Paris green, hellebore, insect-powder, &c., but the latter cannot be reached in this way, and must be subdued by substances that will smother them when applied to their bodies, viz., kerosene emulsion, whale-oil soap, &c. The many beneficial species of insects, such as lady-birds, ichneumons, carnivorous ground-beetle, which prey upon cut-worms, and many others, ought to be familiar to all, so that they should not be wantonly trodden under foot or otherwise destroyed. Excellent figures of all those referred to were shewn upon the screen, and a large number of our most prevalent insect pests, among others, the cabbage-root maggot, the devastating and climbing cut-worms, the May beetle (white grub), pea-weevil and pea-aphis, pear psylla, eye-spotted bud-moth, canker and palmer worms, the cigar case-bearer, plum sphinx and curculio, grape-vine flea beetle, spruce gall-louse, tent caterpillars, codling moth, San José scale, and the lovely Luna moth. Each picture as it appeared was briefly described in the speaker's well-known graphic and often humorous manner, and the interest and attention of the large audience were maintained to the last.

At the close of Dr. Fletcher's address, the following resolution was proposed by Dr. Bethune, who spoke briefly in its support, and seconded by Principal Kirk; on being put to the meeting, it was unanimously adopted:

"That this meeting of the Horticultural and Entomological Societies endorses the idea that the control of the city's horticulture should be in the hands of men who have made this science a study; and that this meeting urges upon the City Council the advisability of placing in the hands of a small committee of citizens the entire control of the shade trees on the streets and in the parks of London, believing that in this way only can the best results be accomplished; and that the secretaries of the two societies are hereby instructed to send copies of this resolution to the Mayor and the City Clerk early in January, 1901, asking that it be brought before the Council at the earliest possible moment, and requesting that action be taken thereon."

At the conclusion, votes of thanks were tendered to the ladies for the musical treat that they had afforded; Professor James and the other speakers for their interesting addresses; Professor Lochhead, for the loan of a number of slides; and Principal Merchant, for the use of the Lecture room and lantern, and the kind assistance that he and Mr. Rennie had afforded.

WEDNESDAY, NOVEMBER 14TH.

The Council of the Entomological Society met at 10.30 a.m., for the transaction of business and the preparation of their report on the proceedings of the past year. The President occupied the chair, and the meeting continued in session till one o'clock.

The Society met at 2.30 p.m. Among those present were the following: Rev. Dr. Fyles, South Quebec, President; Prof. Lochhead, Ontario Agricultural College, Vice-President; Dr. James Fletcher and Mr. Arthur Gibson, Experimental Farm, Ottawa; Mr. Henry H. Lyman, Montreal; Inspector G. E. Fisher, Freeman, Ont.; Prof. F. M. Webster, Wooster, Ohio; Revs. Provost Watkins, and Dr. Bethune, London; Drs. Woolverton and Stevenson, and Messrs. J. A. Balkwill, J. H. Bowman, J. Dearness, H. Gould, B. Green, C. J. Fox, W. Gammage, W. H. Hamilton, John Law, Heard, J. A. Moffat, S. B. McCready, W. E. Saunders, R. W. Rennie, E. A. Brown, H. S. Saunders, and many other residents of London.

The President called upon the Directors and Officers of the Society, the representatives of the Branches, and the chairmen of the Sections for their respective Reports on the work of the past year. These were read and discussed, as follows:

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its Annual Report for the years 1899-1900.

The thirty-sixth annual meeting was held in London in October 1899, and was well attended by members from a distance as well as by those resident in the city. An interesting and important addition to the ordinary proceedings was a conference held during the first afternoon on the San José Scale and the operations that had been carried out for its suppression in the Province of Ontario. A full report of the discussion and of the subsequent proceedings at the meeting has already been published; it is therefore unnecessary to enter into particulars.

The thirtieth Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in December last and was printed and distributed in the following March. It contained 127 pages and was illustrated with sixty-six wood cuts and two plates, one a portrait of Mr. Henry H. Lyman the retiring President, the other exhibiting the structure of a butterfly's wing. Besides the account of the conference on the San José Scale and the proceedings at the Annual Meeting, it contained among many useful papers, the President's address by Mr. Lyman; "One hundred years of American Entomology" and "The home of the San José Scale" by Prof. F. M. Webster; papers by Prof. Lochhead, Mr. Arthur Gibson, Mr. J. A. Moffat, Dr. Bethune, Mr. W. N. Hutt, Dr. Fyles, and articles on the most notable and injurious insects of the year by Dr. Fletcher, Messrs. Harrington, Evans, Moffat, Gibson and Drs. Fyles and Bethune. An addition of much interest was the report of the proceedings at the first annual meeting of the North-West (Canada) Entomological Society, held at Lacombe, Alberta, in November 1899.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 31st volume was completed in December last; it consisted of 377 pages, illustrated with 36 wood cuts and six plates. The contributors numbered no less than sixty, and included well-known writers in England, Germany, Finland, Brazil and Japan, as well as in the United States and Canada. The thirty-second volume will be completed next month; the eleven numbers already issued contain 352 pages and many original illustrations.

An index to the thirty Annual Reports of the Society, 1870 to 1899, has been prepared by the Rev. Dr. Bethune and is now being printed under the direction of the Department of Agriculture. It is expected to be ready for distribution before the end of the year, and will, undoubtedly, be found of very great value by all who have occasion to consult these Reports.

Entomological meetings have been held regularly on Friday evenings, at first fortnightly, afterwards weekly, from October to June, and have now been resumed for the autumn and winter seasons. The study of the Lepidoptera was taken up for several months and when spring opened specimens freshly captured were brought for identification and discussion. The order Coleoptera has been adopted for study during the sessions that have now begun.

The Council is glad to be able to report that the Ornithological Section has been revived and has held regular monthly meetings for a year past; at the same time it has to express its regret that no meetings of the Botanical Section have been held this year. The Geological Section has been as active as usual, holding weekly meetings on Tuesday evenings throughout the greater part of the year, and the Microscopical Section has held interesting meetings on alternate Friday evenings during the autumn and winter months.

Many valuable and interesting additions have been made to the Library and Collections. The Council desires to bear its testimony to the great care taken by Mr. Moffat in the preservation of the Society's books and specimens, and their neat and orderly arrangement. Too much praise cannot be accorded to him for the zeal and interest that he always displays in attending to the welfare of the Society and the good order of its property.

All of which is respectfully submitted.

THOMAS. W. FYLES, President.

REPORT OF THE LIBRARIAN AND CURATOR, FOR THE YEAR ENDING 31ST OF AUGUST, 1900.

Thirty bound volumes of Government Reports, and proceedings and transactions of societies were received during the year. Among them were twelve quarto volumes of the United States Geological Survey, profusely illustrated, with a volume of maps accompanying them.

Thirty-four volumes were bound and added to the library. Among these are some volumes of the Bulletins of the Iowa University (a gift to the library by Rev. Dr. Bethune) one of which is of special interest, being explorations in the Canadian Far North in search of the Musk Ox, by Frank Russell. Also contributions from Drs. Fletcher and Bethune of volumes of the Proceedings of the American Association for the Advancement of Science, which complete the Society's set up to date, and make the number of volumes added during the year 64.

The full number now on the register is 1,691.

Number of volumes issued to local members was 45.

A few additional specimens of Manitoba Lepidoptera have been secured since the last report, which are valuable for reference and comparison.

Nothing of special interest in local captures can be reported for the past season. A few doubtful forms are awaiting determination. Mr. O. C. Poling, of Quincy, Illinois, has kindly and considerately presented to the Society, a fine pair of that rare, singular and interesting butterfly, *Neophasia Terlootii*, Behr., taken in Arizona.

Respectfully submitted.

J. ALSTON MOFFAT.

AUDITORS' REPORT.

Receipts and Expenditures of the Entomological Society of Ontario, for the year ending August 31st, 1900:

RECEIPTS.		EXPENDITURES.	
Balance, September 1st, 1899	$ 576.30	Cork, pins, etc	$ 45.20
Sales of Entomologist	150.69	Expense acct.,(Postage, etc.)	159.79
Sales of Cork, pins, etc	93.58	Library	35.89
Advertising	14 35	Salaries	375.00
Government Grant	1,000.00	Annual Meeting and Report	254.60
Members fees	439 86	Rent	175 00
Interest	13.16	Printing	749 75
		Balance on hand Aug. 31st, 1900,	492.71
	$2,287.94		$2,287.94

We, the Auditors of the Entomological Society of Ontario hereby certify that we have examined the books and vouchers of the Treasurer and find them correct, and that the above is a true statement of the accounts of the society.

W. H. HAMILTON } Auditors.
JAS. H. BOWMAN }

London, Ont., Sept. 18th, 1900.

REPORT OF THE MONTREAL BRANCH.

The 224th Regular and 27th Annual Meeting of the Montreal Branch of the Entomological Society of Ontario was held at 74 McTavish street on Tuesday evening, May 8th, 1900.

The members present comprised Messrs. A. F. Winn (Pres.), Henry H. Lyman, A. E. Norris, E. T. Chambers, J. C. Williams, G. Chagnon, G. Beaulieu, M. W. Davis, C. Stevenson, G. A. Moore, C. P. Newman and L. Gibb. Visitor—Rev. E. C. Trenholme.

The chair was taken by the President and the minutes of the previous meeting, and also of the last annual meeting, were read and confirmed.

REPORT OF THE COUNCIL.

The President then submitted the following report of the Council for the past year:

In presenting their report for the past year your Council is pleased to be able to state that much good work has been done.

Eight regular monthly meetings have been held, the average attendance being ten, and six new members have been added to our roll.

We have again had a visit from each of our good friends, Dr. Fletcher and Rev. Dr. Fyles, in addition we had the pleasure of having Mr. J. G. Jack of Jamaica Plains, Mass., at one meeting and one of our new members, Mr. E. D. Wintle of Como, P.Q., has come to our meetings regularly.

Two field days were held, the first at Beloeil Mountain, St. Hilaire, on May 24, *which was very* successful, many valuable specimens being secured; the other at Chateauguay on July 1st was made a most enjoyable outing, through the kind hospitality of Mr. and Mrs. Jack and their family, but the captures were disappointing owing to the strong wind which was blowing all day. Several members also attended the Natural History Society's field day at Montford.

The following papers were read at the meetings :

Retiring Address of the President—Henry H. Lyman.
Collecting at Electric Light—A. F. Winn.
Note on Emergence of Telea polyphemus—M. W. Davis.
The Genus Hydroecia—Dwight Brainerd.
Spiders—Rev. Dr. Fyles.
A Sketch of the Order Orthoptera—E. M. Walker (of the Toronto Branch).
Tribulations of a Beginner—Dwight Brainerd.
Practical Entomology, or Bee Keeping—Gilbert Wintle.
Bees and Wasps—Dr. Jas. Fletcher.
An Entomological Muddle—Henry H. Lyman.
Chrysophanus thoe—A. F. Winn.
On the Rearing of Lepidoptera—Arthur Gibson.
. Danais Archippus—A E. Norris.

This list probably shows more diversity of subjects than that of any year in the history of the Branch, and the specimens shown at the meetings have included orders that have been little studied here in the past, such as Diptera, Hymenoptera and Orthoptera.

Our collection of books has again been added to by Mr. J. G. Jack, who has presented copies of the report on the Gypsy Moth and two volumes of Memoirs of the Academy of Natural Sciences. A case has been ordered for our books and pamphlets, and the Natural History Society have kindly consented to give us space for it in their building.

The Treasurer's statement shows the Branch to be in a good financial position.

Respectfully submitted on behalf of the Council,

ALBERT F. WINN, President.

The Treasurer then submitted his report, showing a balance on hand of $59.37.

It was moved by Mr. H. H. Lyman and seconded by Mr. C. Stevenson "That the reports of the Council and of the Treasurer be received and adopted." Carried.

The following officers were elected for the ensuing year: President, A. F. Winn; Vice-President, Dwight Brainerd; Secretary, Lachlan Gibb; Treasurer, M. Waring Davis; Librarian, A. E. Norris; Council, H. H. Lyman and G. Chagnon.

Mr. Henry H. Lyman read a paper on the Life History of Euchaetes Oregonensis, and also exhibited a pamphlet entitled Memoirs of the Chicago Entomological Society.

A letter was read from E. Brunetti, London, England, asking for exchange in Canadian Diptera, which was referred to Mr. Chagnon.

After examining a number of specimens shown by the members the meeting adjourned.

LACHLAN GIBB, Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec branch of the Entomological Society of Ontario was held on May 12th, 1900, the president, Rev. Dr. Fyles, occuping the chair.

PRESIDENT'S ADDRESS.

The Quebec branch of the Entomological Society of Ontario has entered upon the fourth year of its existence. During the past year several things have happened to occasion our members much concern.

Death has removed two from amongst us. Mrs. Treffry departed this life a few months ago; and on April 27th, Mr. Treffry after a very brief illness was also taken away. We shall miss the active interest he took in our affairs. His ability as a journalist and his ready pen were often exercised in the interests of the Branch and his cheerful good-nature, before sorrow overtook him, added to the interest of our meetings.

Next we have to record the closing (temporary it is to be hoped) of Morrin College. The reduction of the grant from the Suporior Education Fund, the inadequacy of the number of paying students to make up for this, and the failure of support from our decreasing English speaking population, militated seriously against its interests and made it impossible to maintain its very efficient staff of professors without trenching too far upon the capital funds of the Institution. We hope that the privilege of meeting in the College rooms will still be allowed us.

The late principal, Dr. Macrae, and Professors Clark, Gunn and MacIntyre took a kind interest in our proceedings; and in Professor Walters we have had a firm friend and valuable member. Should he be called from the city, we shall regret his departure deeply at the same time that we shall indulge the hope and heartily pray that health and prosperity may attend him and his family wherever their lot may be cast.

An untoward accident in the beginning of March interfered for two months with the regular course of the proceedings of the branch, but before that its meetings were regularly held and well attended.

Four field days were held in the course of the summer: two at the Gomin; one (by invitation) in the grounds of E. H. Wade, Esq., at New Liverpool and one at the Island of Orleans.

At the meetings in Morrin College, the following subjects were considered:—Noah's Flood and the Insect World: Ichneumon Flies; Dragon-Flies; "The Kissing Bug"; the Hemiptera; the Ceratocampidae and the Saturnians.

At one of the meetings a most interesting narrative of an entomological expedition to the country north of Brandon, Man., written by Mr. A. Hanham of Winnipeg, was read and fully appreciated. At another meeting many very beautiful southern moths presented to the president by Mr. H. H. Newcomb of Boston were exhibited and greatly admired.

Among the interesting captures of the season were: *Thyatira rectangulata*, Ottolengui, which was taken on the Island by Mrs. Turner; a fine specimen of the salmon-colored variety of *Hepialus argenteomaculatus*, Harris, taken at light at St. Paul, Quebec; *Catocala Bianca*, Hy. Edwards, also at light at Levis; and a very fresh specimen of *Ufeus Satyricus*, Grote, caught on the wing at the Chaudière, on the *20th of January* by Mr. Charles Barclay.

A new pest has made its appearance in this province viz: the American Cockroach (*Periplaneta Americana*), a specimen of which was found at St. Paul, Quebec, on the 21st of April. This makes the fourth kind of cockroach that has shown itself in Quebec Province. The other three are the German Cockroach (*Ectobia Germanica*); the Oriental (*Blatta orientalis*) and the Australian (*Periplaneta Australasia*). All these insects are troublesome and disgusting, but they are incapable of inflicting personal injury. A very effective trap for them may be purchased in the hardware stores. Rapid and constant intercourse with all parts of the continent will doubtless bring many insects within our borders.

By far the worst pest that of late years has shewn itself in Canada is the San José Scale. Up to the present time it has not been found in the Province of Quebec; but in Ontario its ravages have occasioned much dismay. Fortunately the Ontario Government are aware of its dangerous character and are taking timely and stringent measures to check its course. The report of a very interesting discussion upon this scale is printed in the Society's Annual Report which will shortly be in the hands of the members.

It is to be hoped that the coming season will be a favorable one from an entomological point of view; that no troublesome insects may increase to cause alarm and that many rare and beautiful specimens may reward the efforts of our collectors.

REPORT OF COUNCIL.

The branch now includes 43 members: 33 adults and 10 juniors.

The Treasurer's report gives a very satisfactory showing.

Several excursions were made during the year and were very successful.

Owing to an accident to our worthy president the course of lectures had unfortunately to be interrupted to the great regret of the members.

Our thanks are due to the authorities of Morrin College for having continued to allow us to use their rooms for our meetings.

H. WALTERS, on behalf of the Council.

It was moved by Miss Hamel, seconded by Mrs. Poston, and unanimously resolved that the thanks of the meeting be tendered the council and the officers.

The following were then elected:

President, the Rev. Dr. Fyles.

Vice-President, Miss E. MacDonald.

Council, Mrs. R. Turner, Mr. James Geggie, Professor Walters, Hon. R. Turner, Miss Bickell, Miss Winfield.

Secretary-Treasurer, Lt.-Col. Crawford Lindsay.

Curator, Prof. Walters.

Since the above report was written Morrin College has been re-opened, and has a large attendance of students. The Quebec Branch of the Entomological Society of Ontario has commenced its regular work and is in a very healthy condition. At the last meeting twenty-two members were present and four new members were elected. Before the close of the season it held a happy field-day in the grounds of James Geggie, Esq., at Darnoc, Quebec.

THOMAS W. FYLES,
President of the Quebec Branch.

REPORT OF THE TORONTO BRANCH.

The fourth annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Education Department (Normal School), on Friday evening, the 6th April, 1900.

The following members were present: Messrs. E. M. Walker (Vice-President), G. M. Stewart (Secretary-Treasurer), H. C. Austin (Librarian), D. G. Cox, R. J. Crew, C. H. Tyers and S. R. Carter; visitor, Mr. A. Cook.

In the absence of the President, the Vice-President took the chair.

The minutes of the previous regular meeting were read and approved.

Messrs. Geo. Smith, Geo. Rossiter, Albert Cook and W. H. Harrison were duly elected members of the Branch.

The Secretary read the following report of the Council for the year ending 31st March, 1900:

REPORT OF COUNCIL.

The Council of the Toronto Branch of the Entomological Society of Ontario take much pleasure in presenting the Fourth Annual Report of the proceedings of the Branch for the year ending 31st March, 1900.

They are pleased to report that since the last annual meeting the membership of the Branch has been increased by the addition of one new name, viz, Mr. D. G. Cox, and as some of the meetings have been attended by visitors, no doubt others may be induced to take an interest in our work in the near future.

During the past year fifteen regular meetings have been held in the Education Department, with a fair average attendance of the members. The Council is pleased at the result of Mr. Lyman's suggestion that papers be exchanged between the Toronto and Montreal Branches, and is much indebted to the members of the latter Branch for the interesting papers so kindly contributed. As a partial return, Mr. Walker's paper, mentioned below, was forwarded to be read before the Montreal Branch.

The following is a list of the papers read before the Branch during the past year:

Annual Address of the President, Mr. R. J. Crew.

Notes on Danais Archippus, Mr. H. H. Lyman, of the Montreal Branch.

A Sketch of the Order Orthoptera, with special reference to the Ontario Forms, Mr. E. M. Walker.

Collecting at Electric Light, Mr. A. F. Winn, President of the Montreal Branch.

The Rearing of Lepidoptera, Mr. Arthur Gibson.

Notes on the Anatomy of Belostoma, Mr. G. M. Stewart.

An interesting feature of the year's work was an open meeting held on the 5th of January, at which a large audience was present, including many Normal School students. Dr. Fletcher, of Ottawa, Dominion Entomologist, gave a most interesting lecture on "Bees and Wasps." Dr. Bethune, of London, editor of the *Canadian Entomologist*, also gave an interesting address on the aims of entomology, and spoke of the work being done by the Entomological Society of Ontario and its Branches.

During the year several field days were held and many interesting captures were made.

The work of classifying the collection of insects made by the Branch for the Education Department is progressing well, and it is gratifying to know that the species already collected and donated have been transferred into the cases, in the Department. During the coming season the Council would urge the members to collect largely so that by next winter the Department may be in possession of a fairly good reference collection of the insects of Ontario.

The report of the Librarian shows that many valuable Government publications have been added to the library, also that two periodicals have been subscribed for, and several books purchased during the year.

The Treasurer's report shows a small balance carried forward on the right side.

Respectfully submitted on behalf of the Council.

Arthur Gibson,
President.

The report of the Treasurer was then presented, as was also that of Mr. Austen, as Librarian, and on motion the reports of the Council, Treasurer and Librarian were duly adopted as read.

The election of officers for the ensuing year resulted as follows: President, Mr. D. G. Cox; Vice President, Mr. E. M. Walker; Secretary-Treasurer, Mr. G. M. Stewart; Librarian, Mr. H. C. Austen; Members of Council, Messrs. R. J. Crew and C. N. Tyers.

The address of the retiring President, Mr. Arthur Gibson, was read by Mr. Walker, Mr. Gibson, owing to his duties as assistant in the Division of Entomology at the Central Experimental Farm, Ottawa, being unable to be present. The work of the Branch since its inception was reviewed, particular attention being made ef the year just ended. The members were urged to make extra efforts the coming summer to collect and mount specimens for the collection which the Branch is forming for the Educational Department for Ontario. The latter portion of the address took the form of a practical illustrated paper on "The Preservation of Larvæ by Inflation."

A vote of thanks to Mr. Gibson for his interesting address was carried.

The meeting then adjourned.

G. M. Stewart,
Secretary.

REPORT OF THE MICROSCOPICAL SECTION.

A meeting for the organization of the Section was held on November 4th, 1899, and the following officers were elected for the ensuing year: W. E. Saunders, Chairman; S. B. McCready, Secretary; J. A. Balkwill, J. Dearness and J. H. Bowman, Committee.

During the season eleven meetings were held, with an average attendance of seven, besides occasional visitors. At each meeting interesting subjects were discussed and the objects referred to examined under the microscope; five papers were read, viz.:

The Protoplasmic Cell—J. H. Bowman.
The Multiplication of Cells—J. Dearness.
The Protoplasmic Cell—J. Dearness.
Micrometry—J. H. Bowman.
The Natural History of Florida—W. E. Saunders,

One meeting was given over to the examination of freshly collected living organisms, two to the examination of exceedingly beautiful chemical crystals, prepared on the spot by Mr. Bowman, and one to the discussion of fermentation.

At the fourth meeting Mr. Thos. Beall, of Lindsay, brought before the members the desirability of forming a Horticultural Society in London. The project was highly approved of and energetically taken up, resulting in the formation of the very successful and enterprising London Horticultural Society.

W. E. Saunders,
Chairman.

REPORT OF THE ORNITHOLOGICAL SECTION.

The reorganization meeting of the Ornithological Section of the Entomological Society was held on January 13th, 1900. Officers were elected and an outline of plans was made for the season. Monthly meetings were adopted, omitting July and August. This programme has been strictly adhered to. Nine meetings have been held, at which the average attendance has been five, and ten papers have been read, entitled as follows:

"New Birds for Middlesex and Ontario," W. E. Saunders; enumerating six species new to Ontario and eight species new to Middlesex County, all taken since the last meeting in 1894.

"An Ornithological Incursion into Florida," W. E. Saunders.

"The Sparrows of Ontario," J. E. Keays; enumerating the generic and specific peculiarities of each species, with notes on their habits, fully illustrated by specimens.

"The Cubic Contents of the Eggs of the Common Buteos," J. E. Keays.

"The Nesting of the Sharp Shinned Hawk," H. Gould.

"The Flycatchers of Ontario," W. E. Saunders.

"The Grebes and Loons of Ontario," W. E Saunders.

"A Trip to Point Pelee," H. Gould; illustrated by specimens.

"A New Song for a Common Bird," W. E. Saunders.

"Seasonable Changes in the Food of Sparrows," J. E. Keays.

Two of the above-named papers have been published and others will be in the near future. Besides these, short notes on interesting subjects have been presented, one recording the capture of two specimens of the Long-tailed Jaeger, at Rondeau,—the first for Ontario.

The spring arrivals have also been closely recorded, 144 species being noted by members up to May 26th. Dates of the fall migrations are also being prepared and are now about complete.

A number of fine sets of eggs have been taken by the members, the best of which were six sets of the Sharp Shinned Hawk, and five sets of the Cerulean Warbler. An account of the work done on this bird was published in *The Auk* for October.

Bird protection in London was also taken up, and notices published in the papers that wanton destroyers of our native birds in the parks would be prosecuted, which notice accomplished the cessation of some shooting which had previously been going on.

All the choice new material taken by the members has been exhibited by them at the meetings, which have been interesting and enthusiastic.

J. E. Keays,
Chairman.
W. E. Saunders,
Secretary.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present its annual report as follows:

The section with Dr. Wolverton as chairman continued its meetings weekly as usual, with but a short holiday, throughout the year. The interest in Geological study was well maintained. The Huronian rocks with many of their characteristic minerals formed the principal study, while local fossils and minerals of the Devonian period received due attention. Visits for the purpose of securing specimens were made to interesting localities in Ontario and Michigan, by members of the Section, and our table was frequently well supplied with the essentials of this department of Nature Study.

The Society mourns the loss of one of its charter members, Mr. Thos. Green, who passed away at the ripe age of eighty-seven years. His brother, who is over eighty years of age, is still a member of our Section. Until a short time before his death, Mr. Thos. Green was an energetic student of Nature, and materially added to the profit of our meetings.

The Chairman reported as follows: "I have made a special trip to Manitoulin Island and the Georgian Bay District for the purpose of obtaining characteristic fossils and minerals of these regions, as a basis for the study of the Huronian formation during the winter. I travelled in all by water 450 miles, and secured a great variety of vein matter consisting of quartz, mica, plumbago, feldspar, molybdenite, bornite and other copper ores, as well as many specimens of corals.

Manitoulin Island abounds in fossil coral, and good specimens were obtained, as you may see from the collection before you. We will make a detailed study of these during the ensuing year."

Our Chairman and Mayor Rumball of this city, also visited a farm in West Nissouri township to inspect the remains of what was one of Earth's most mighty creatures. During the Western Fair this year there were exhibited about thirty bones of gigantic size supposed to be those of a Mastodon or some closely related species of that class. Owing to the absence of teeth and most of the bones of the head, it has not been identified so far. These bones were uncovered recently by some men while excavating a drain through a peat bed, and are in a good state of preservation. The tusk measures more than nine feet in length. It is curved like a cow's horn and tapers to a point. The corrugations on the tusk where it entered the head are easily discernible. The femur is three feet in length and where it entered the socket, it is three feet in circumference. The tibia and fibula are well preserved and the foot bones are entire. Four ribs of large size are made to articulate with the vertebræ by ball and socket joints, attesting the great antiquity of the fossil.

From the position in which the bones were found, it would appear, that the giant becoming mired in the bog fell over and lodged probably against some partially submerged log and strangled. From a careful inspection of the locality where the bones were found our Chairman thinks other parts ef the skeleton may yet be discovered, as no thorough search has yet been made. It is hoped by many citizens, as well as by the members of our Section, that London may be the final resting place of these interesting remains.

Efforts are now being made to establish a public museum in the city in connection with the Free Library. The question has been mooted in the press, and was thoroughly discussed at a meeting of the Library Board, and there is reason to hope that this treasure will not be allowed to leave our district.

In connection with the museum, Dr. Wolverton and other citizens have offered to loan valuable collections for a term of years and as only a small expense would have to be incurred in fitting up the rooms in the library building, there would appear no sufficient reason why we should not have this important means of education secured to us.

Our correspondent, Rev. Dr. Philp, of Petrolea, sent us two very interesting accounts of trips he made to points in Lambton County. The first was to a point near Shetland on the Sydenham about eight miles north of Bothwell, to inspect the shale beds which he found exposed there for some distance along the river bed. They belong to the Portage Chemung group. The shale is very dark, almost black, bituminous and filled with nodules of iron pyrites. These shales are beautifully stratified and "we were compelled," he says, "to think of ice sawn for storage." The shale in every respect resembled that at Kettle Point. Fragments of very large concretions (Kettles) were discovered, hemispherical in shape, the tops apparently cut off by the ice when the water was about sixteen inches higher than at present. We also found in the vicinity several kettles firmly embedded in the shale, each of them five feet in diameter.

A little further north we came upon two outcrops of limestone each about seventy feet in length; one runs parallel with the river and the other at right angles. On each side of these outcrops kettles are ranged. These vary in size and shape. They are from one-half to two-thirds of complete globes. Crevices in the limestone are filled with material of the same composition as the concretions. Though we searched diligently for impressions of calamites we did not succeed in finding any at this place.

At a place three miles up the Sydenham from Shetland the Lambton limestones are exposed. They are very fossiliferous and are crowded with Spirifera Mucronata.

The Rev. Jos. Philp also visited the Enniskillen gum beds and reported to us his findings, and sent a fine specimen of what he terms mineral Caoutchouc. It was obtained from lot 16, second con., Enniskillen, near Oil Springs.

The bed is situated on the surface, and is quite extensive, though much of it has been removed and used as fuel for steam raising. With a fan blast it burns well. In appearance it resembles tar. It is almost jet black, dense and solid, somewhat resembling asphalt. People select the cleaner parts and use it as chewing gum. They say it is better than it looks. It is probably of the same origin as the petroleum found in the same vicinity.

Mr. Philp also examined the bituminous shales of Alvinston which are exposed at that point for nearly a mile along the river. They belong to the Portage Chemung group. He found one impression of a Calamite, very distinct. The stratification and the cleavage are noteworthy and the nodules of iron pyrites are very beautiful. At this point there is no trace of a kettle. He thinks the kettles are found only in the lowest portion of this formation. At least that is the case at Shetland, where the older strata are exposed.

THE LAKE SUPERIOR COPPER MINES.

Mr. Goodburne, who visited the Lake Superior copper mines in October, 1899, read a paper descriptive of that region, opening with a brief description of copper and its ores. The first record of the discovery of copper in the Keeweenaw Peninsula, Michigan, was in 1636, and from that date its history was traced down to the present day. Mining, however, dates only from 1831, when Dr. Douglass Houghton, while a member of the Schoolcraft expedition, first made known the great wealth of the peninsula, and in 1834, the government first opened up the country to mining. From a review of the history of early mining, Mr. Goodburne proceeded to a description of the principal mines, chief interest centering in the great Calumet and Hecla, which yields 100,000,000 pounds of refined copper annually from the conglomerate lode underlying 20 acres of surface, a product valued at $18,000,000, taken from under land, which originally cost $1.25 per acre, or $25.00 for the most valuable copper mine in the world.

The great Keeweenawan formation consists of a series of eruptive beds, alternating in the upper division with sandstone and conglomerates, the whole lying above the Huronian slates, schists and metamorphic rocks. The formation was, probably, originally horizontal at the bottom of the ancient sea. The system to the east is the Medina division of the Silurian formation, a time when great volcanic forces disturbed the earth; but it was probably the subsequent movements of the crust which tilted the beds so as to form a great trough or synclinal. The eastern edge is on the end of Keeweenaw Point, and the western across the Minnesota border. Michipicoten Island and the Nepigon district are on the reverse, or northern, fold of the synclinal, for while the Michigan edge dips toward the northwest, the northern edge dips in the opposite direction, but it is very much broken by depressions, and not so easily traced as the southern edge. The lower beds of the Keeweenawan formation consist mainly of a series of coarse crystalline gabbros, from 20 to 50 feet thick. There are 4,000 or 5,000 feet of these lava flows, after which the eruptions became somewhat different in chemical character, and more frequent, with thinner flows. These flows contain the copper. The lava is generally basic, like basalt, but acid and intermediate types are present. Among the typical kinds may be mentioned gabbro, diabase and melaphyr, including the amygdaloidal examples of the two latter, in which is the copper. Other rocks are the acid lavas, including felsites and porphyries, which have furnished much of the detritus for the sandstones and conglomerates, and these acid lavas, which do not flow as far or so freely as the basic, quite often trend across the other rocks in the form of dikes or bosses, with dome-like summits.

The copper occurs in the trap formation, which cuts the centre of the peninsula, and continues its course southward through Ontonagon county, extending westward through Wisconsin, to the western shore of Lake Superior, thence northward to Isle Royal, where it disappears on the mainland, appearing again in the Nepigon district. In all these places the geological characteristics are the same, thin sections of rock from one district being scarce distinguishable from a specimen taken from another. Eastward, the copper is found on Michipicoten Island, and the formation is traceable at Gros Cap, a few miles from Sault Ste. Marie.

The copper is not an ore, but is the virgin metal, all the paying mines being opened on lodes which carry native copper. There are a few fissure veins in Keeweenaw County (on the north of the peninsula), which carry grey sulphurets producing as high as 25 per cent. refined copper. All the mines produce considerable amounts of native silver, and the Quincy Company reduces its mineral by electrolysis in order to save the silver, which averages 38 ounces to the ton of copper.

When the lava flows rested under the ancient sea, the interstices in the frothy portion were filled with copper by electro-chemical action, forming the amygdaloidal rocks. The conglomerates are ancient sea beds, formed of boulders, sand and gravel, broken from the surrounding rocks of the ancient sea. These also had interstices, and were filled with copper in the same manner.

That the copper was carried in solution and arrested in its present position by some precipitating agent is conceded by most authorities; and that it was intimately associated with the melaphyrs that have had their ferrous iron changed into a ferric state by taking up more oxygen, has given rise to the now widely accepted theory that in the peroxydation of the ferrous iron is to be found the agent of precipitation. The origin of the copper is not so easily explained. One theory is that the copper was brought to the surface by the lava flows; another that it was deposited in a sulphuretted form, along with the detrital rocks of the period.

Mr. Goodburne illustrated his paper with diagrams of the district, showing the synclinal, and the position of the mines; and exhibited many beautiful specimens of copper and silver, from the form in which it was mined, until the copper was gathered from the great stamp mills.

We offer a suggestion to the other sections of our Entomological Society.

As it is difficult to secure members to replace those lost owing to removals, deaths and other causes, we would suggest occasional public meetings under the auspices of the parent society at which there should be a programme of addresses on subjects relating to nature study illustrated where practicable by views. These public meetings would advertise our society and would tend to increase both the interest and profit of the meetings.

G. KIRK,
Sec. *pro tem.*

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA,

Through the Rev. C. J. S. Bethune, D. C. L , Delegate.

During the year that has gone by since our last report to the Royal Society, the Entomological Society of Ontario has pursued the even tenor of its way and continued its useful and scientific work. There are no striking events to record, but much has been done of permanent value and additions have been made to the general store of the knowledge of insects and their ways.

The thirty-sixth annual meeting of the Society was held in October last at its headquarters in London and was especially noteworthy for the conference that was held on the important subject of the San José scale. Those who took the principal part in it were Prof. James, Deputy Minister of Agriculture for Ontario; Dr. Fletcher, Entomologist and Botanist of the Experimental Farms of the Dominion; Mr. J. Dearness, one of the special commissioners appointed by the Ontario Government to investigate the ravages of the scale in this Province; Mr. G. E. Fisher, Official Inspector; Professor Lochhead of the Ontario Agricultural College at Guelph, and Professor Webster of the Ohio State Agricultural Experiment Station. The proceedings at the Conference are published in full in the 30th Annual Report of the Society, which was presented to the Legislature of Ontario at the opening of its last session.

The Report also contains a number of valuable and interesting papers and is illustrated with sixty-six wood-cuts, many of them drawn specially for the purpose, a portrait of Mr. Henry H. Lyman, the retiring President, and a plate representing the structure of a butterfly's wing. Among the papers may be mentioned the following: "The President's Annual Address," by Mr. Henry H. Lyman, Montreal, in which the formation of an entomological union for the authoritative settlement of questions of nomenclature especially, was strongly advocated; an account was given of the importance of accurate descriptions of larvæ and the difficulties to be surmounted in making them; a short review was made of the principal work of the year in both economic and systematic entomology, and some account of recent publications was given. "One Hundred Years of American Entomology," "The Native Home of the San José Scale," and "Some Notes on the Larval Habits of the Gray Hair Streak Butterfly," by Prof. F. M. Webster. "Notes on some Insects on Coniferous Shade Trees," "Injurious Insects of the Orchard, Garden and Farm in 1899," "Nature Study Lessons on the Cabbage Butterfly," by Prof. W. Lochhead, Guelph. "Spiders," by the Rev. Dr. Fyles, South Quebec. "The Wing Structure of a Butterfly," and "Remarks upon some Cuban Insects," by Mr. J. Alston Moffat, London. "Fatal Bite of an Insect," and "Some Observations of a Bumble bees' Nest," by Rev. Dr. Bethune, London. "Injurious Insects in Ontario During 1899," by Dr. Fletcher, Ottawa. "The Electric Light as an Attraction to Moths," by Mr. A. Gibson, Ottawa. "Asparagus Beetles," by Mr. W. N. Hutt, Southend.

The volume contains the reports on the work of the preceding year by the different officers of the Society, the Geological and Microscopical Sections at London, and the flourishing branches in Montreal, Quebec and Toronto. There are also valuable "Notes on the Insects of the Year," by the Directors, Messrs. Harrington, Evans and Gibson, in their respective territorial divisions, and by Messrs. Moffatt, Bethune and Fyles on the season of 1899.

The report concludes with an account of the first annual meeting held at Lacombe, Alberta, in November last, of the new and vigorous North-West (Canada) Entomological Society, which is fortunate in having Mr. Percy B. Gregson, of Waghorn, as its energetic President. The report of its council, the President's address, and papers by Dr. Bethune on "The use of Entomology;" Dr. Henry George on "The Pocket Gopher," and an address by Mr. Henry H. Lyman, are published in full.

The librarian states that the library of the Society now contains 1,627 bound volumes, besides a large number of pamphlets and periodicals. The chief additions to the cabinets of insects have come from Manitoba and Cuba.

Four distinguished entomologists were elected honorary members of the Society, viz: Dr. L. O. Howard, United States Entomologist, Washington, D. C.; Professor John B. Smith, Sc.D., Rutgers College, New Brunswick, N. J.; Professor F. M. Webster, Wooster, Ohio; and Professor H. F. Wickham, M.A., Iowa City, Iowa.

The Society has continued to publish its monthly magazine, "The Canadian Entomologist," which was begun in 1868, and of which the thirty second volume is now being issued. The thirty-first volume was completed in December last and consisted of 380 pages illustrated with six photo-gravure plates and thirty-six wood-cuts; thirty new genera of insects are described and ninety-two new species. The contributors number sixty, of whom sixteen are residents in various parts of the Dominion, thirty-nine in the United States, and one each in England, Germany, Finland, Brazil and Japan. Among the large number of important papers may be mentioned the descriptions of Coccidæ from both North and South America by Professors Cockerell and Tinsley, and Messrs. Ehrhorn, Parrott, King, Hempel (Brazil) and Marlatt.

Papers on Classification: The Entomophilous Wasps by W. H. Ashmead; Dragon Flies by Jas. G. Needham; North American Myrmelionidæ by N. Banks; Coccidæ by Prof. T. D. A. Cockerell; Bees by Chas. Robertson; Wasps by S. N. Dunning; descriptions of new species: Lepidoptera by Prof. J. B. Smith, Dr. H. Skinner and Dr. H. G. Dyar; Orthoptera by Dr. Samuel H. Scudder and Jerome McNeill; Hymenoptera by

Carroll Fowler and W. H. Harrington; Diptera by D. W. Coquillett; Neuroptera by Rolla Currie; and Hemiptera by A. L. Quaintance and Otto Heidemann.

A list of Manitoba Moths by A. W. Hanham; the Coleoptera of Canada by H. F. Wickham; Ontario Acrididæ by E. M. Walker; Canadian Lepidoptera by J. A. Moffat, T. W. Fyles and E. F. Heath.

Papers of an Economic character by Enzio Reuter (Finland), M. Matsumura (Japan), F. M. Webster, R. H. Pettit, W. Lochhead, E. A. Carew-Gibson, and others.

From the foregoing list, which does not include short notes, book notices and other items of interest, it will be seen that the magazine covers the whole field of systematic entomology and contains articles of importance by well-known authorities on most of the orders of insects. It has become so necessary to the working Entomologist that there is a constant demand for complete sets of the volumes from the beginning and the Society has in consequence been obliged to reprint several of the earlier numbers.

SAN JOSÉ SCALE DISCUSSION.

At the request of the President, Mr. G. E. Fisher, of Freeman, Ont., the Provincial San José Scale Inspector, stated that he was present by direction of the Ontario Department of Agriculture, and was willing to give any information at his disposal with regard to the prevalence of the San José scale in the Province, and the work which had been done during the past season. He regretted to say that the state of affairs was not as favourable as he could wish, and that the scale was now known to be present in many districts where it had not been discovered last year. Many experiments had been tried by instruction of the Department to see if a practical remedy could be discovered to control the insect instead of the drastic measure of cutting down the trees. He was glad of the opportunity to let the members of the Entomological Society know what the general trend of his experiments had been. To begin with he would make the statement that the infestation of Ontario orchards by the San José scale was a far more serious matter than fruit growers of the Province yet realized.

The following is a condensed summary of Mr. Fisher's address:

A great deal was said at the last annual meeting of the Society about the value of whale-oil soap as the best remedy for the San José scale, and particular mention was made of the satisfactory condition of orchards now standing on Catawba Island, which had formerly been badly infested by the scale. I therefore took great pains during the past summer and carried out many careful experiments with this material, using the strength recommended as the best, namely, 2 lbs. of whale-oil soap to one gallon of warm water, as well as other quantities. When a tree was known to be infested it was treated thoroughly with 2 lbs. to the gallon, and all trees in the immediate neighbourhood were also sprayed with a solution of 1½ lbs. to the gallon. On other trees kerosene emulsion or crude petroleum were used, and careful notes taken of their effects upon the tree and the scale. With regard to the soap, the results were rather disappointing. In no case was the scale entirely eradicated, even when the soap was applied with the greatest care, according to the formula Some trees where the full strength of 2 lbs. to the gallon was used are still infested, and the infestation is of about the same extent as at the beginning of the season. The scale was certainly reduced on cherry trees, and it was noticed that the soap had an excellent effect in clearing these trees of aphids. The treatment was applied just at the time the buds were bursting, when most people would think it was too late to use it without doing injury to the trees, but I found that no harm was done even when many of the blossoms were open. As a rule there is too much blossom on trees, and if some of this is destroyed it is an actual advantage, therefore this late spraying may be very beneficial. We have noticed that the young scales will move out on to a part of the tree which had been sprayed in the spring with the soap mixture, and will settle there and multiply. On the 18th August last I made an application, at Niagara, on a very badly infested tree, one, in fact, which was entirely covered by a moving mass of young crawling scale insects, walking all over the tree trying to find a place to settle. The soap was applied to the tree with a whitewash brush, with the object of finding out how reliable the soap was, and a little later a second application was made. I examined the tree again about the middle of November, and I think I had the nicest example of the multiplication of the scale that could be found. The soap had killed the scale in the first place, of course, but the tree was just now in the same condition as when it was first applied, and the scales were multiplying on the part which had been washed with the soap. Below the untreated portion and for probably a foot and a half down over the part which was washed with soap, the larvæ were coming down in great numbers and there were actually mature females giving birth to young. This shews that washing with soap will not deter the scale insects from settling there and starting new colonies. In the middle of September I took my knife and scraped off the scales from a space one inch by two, clearing the bark entirely, and in two days this space was again entirely covered so that no bark could be seen. In the middle of October the same experiment was tried and the only difference was that it took twice as long for the space to be occupied again by the scales.

Kerosene also has been somewhat unsatisfactory. Trees have been killed and the scale does not seem to have been cleaned up. Crude petroleum has I think on the whole given the greatest satisfaction. Where it was applied on apple trees I have seen no bad results. I applied crude petroleum in one orchard to about 40 apple trees and 100 plum trees without in any way injuring a single tree. This was done about the middle of May. The trees were entirely freed from the scale and all that had been alive during the winter previous were cleared off. Case-bearers and many other insects were also destroyed. The material used was a mixture of 25 to 30 per cent crude petroleum with water, and applied as a spray. I am of the opinion that a mixture of half the quantity of soap recommended and half of crude oil in a combination pump would be preferable to either used alone. The crude petroleum will kill the scale insects but if applied in considerable quantities is apt to injure the peach and other tender trees. Great care should bé exercised in applying it as advised. The soap alone is not a strong enough application, it does not kill enough of the scales. I do not think it would be safe to recommend crude petroleum for general use. People did not use whale oil soap in accordance with instructions given and the chances are they would not follow instructions when using crude oil, and thus trees would be killed. Judging from the experience of the past year I think some of the reported cases of injury by crude petroleum may be due to the way in which the substance has been applied. It must be borne in mind that no portion of the tree should be covered more than once by the spray or the oil will accumulate from each spraying until there is sufficient to injure the tree. I notice frequently when people are spraying that they begin on the trunk then spray the branches and when finishing bring the nozzle down again on to the trunk thus giving that part of the tree a double dose of the oil. This carelessness I think is the cause of much of the injury reported. The way that we spray is as follows: The pump is placed on an ordinary stone boat, one man sprays in one direction and one in another, and each tree is sprayed from four standpoints, or in other words as it is approached and as it is left behind in passing down the rows on each side of it. There is one part of the tree which is frequently overlooked when spraying, that is the upper side of the limbs on the opposite side of the tree to that which is being treated. This can only be reached by pushing the nozzle into the head of the tree and spraying over to the opposite side. (Mr. Fisher here passed around the meeting, specimens of infested wood, which had been cut from trees which had not been treated at all, and others from those treated with 2 lbs. of whale oil soap to the gallon or which had been sprayed with a 30 per cent mixture of crude petroleum. It was noticed that all these had some living scales on them.) In summing up the matter of remedial treatment I think the best results will follow if work is done in the month of April both with whale oil soap and petroleum applications. A perfect remedy should remain fresh for a long time, it must penetrate easily and must of course destroy the scales without injuring the tree. Soaps made entirely with potash are the best—soda makes a hard soap which solidifies on the trees. I have never seen an apple tree which was in any way injured with crude petroleum applied of the strength I have mentioned. The whale oil soap from Catawba Island has done the best work and it was only in the case where this Ohio soap had been used that the infestation did not increase. In the case of the other soaps tried the infestation has increased beyond what it was last spring. Many people did not know of the presence of the San José Scale in their orchards until they found it on the fruit. Almost the whole of the Niagara district is now infested with the scale and it is also very prevalent in the Guilds section where little has been done to check it. The San Jose Scale has spread much during the past season and it is now abundant where it was hardly noticeable last year. It seems to me as if this scale question is going to develop into a great national calamity, and the time will come I fear when our grandchildren may have to tell their children of the good old times in Ontario when people used to be able to grow apples and other fruits.

With regard to the work of the scale it was formerly claimed that the fruit of the peach would not be injured on account of the fuzzy down upon its surface, but during the past summer I have seen peaches so covered with scales as to have the appearance of red apples, from the discoloration due to the injurious presence of the insect.——

Mr. Fisher here gave a review of the history of the San José Scale in Ontario and the excellent work that had been done by the Government in fighting it and protecting the fruit growers from loss. He was glad to find that public opinion was changing rapidly with regard to the work that was being done. He said "at Niagara, particularly, everybody is realizing that a very great danger threatens them and that something must be done or their interests will be destroyed. The fruit interests in Ontario are very great. One gentleman in St. Catharines sold $10,000 worth of peaches in 1899 and another at Niagara sold over $4,000 worth this year, and these peaches do not by any means represent their whole crop of fruit, as there are plums, cherries, pears, apples and small fruits beside. Some years of experience have taught us that when once we discover the San José Scale in an orchard no idea can be formed without close examination as to the extent of the infestation. In 1899 one orchard was examined carefully and 87 trees were marked—about the middle of this summer I visited this orchard and traversed it from one corner to the other, and I found the scale on every single tree I examined, and moreover on the very first twig I took hold of in every case. A good deal has been said about the rate at which scales can travel, and I am sure that this has been underrated. I have watched them a great many times and find that the young larvae can travel an inch in a quarter of an hour so that in a week they could travel half way across an orchard, and if blown to the ground I am quite sure they are capable of getting back again on to the tree. In addition to this there is no doubt they will crawl on to everything that moves and by that means will be carried in every direction. The increase of the scale is very rapid indeed towards the end of the season, especially during the month of September. Notwithstanding all that I have said, and remembering the state of affairs on Catawba Island, it would seem that if an orchard is treated conscientiously and regularly the scale will not exist in sufficient numbers to materially mar the crop of fruit. This is particularly true of the early varieties, which are practically developed before the season of the greatest increase of the scale. I may mention that during the past season I have noticed a very large number of the little black lady-bird beetles (Pentilia misella) which have done such good work in feeding on the scale.

Dr. Fletcher congratulated the Society on having Mr. Fisher present at the meeting. His excellent and careful work on the San José Scale was well known. He was somewhat disappointed at the results of Mr. Fisher's experiments with whale oil soap. This remedy was an extremely valuable one, he had used it a good deal and considered that a good caustic potash fish oil soap such as the Ohio soap made by Mr. Owen, was one of the very best remedies against plant lice and bark lice of all kinds, moreover the amount of potash 12% was sufficient to act as a decided fertilizer to the trees. Many have noticed the good effect of this soap upon trees where it had been used. It was also claimed by the manufacturers to be an excellent remedy against the Peach Leaf Curl and some other fungous diseases. He considered that the thanks of the Society were due to the Honorable Minister of Agriculture for instructing Mr. Fisher to attend the meeting and to Mr. Fisher himself for the valuable and practical address he had given. Everybody who heard Mr. Fisher knew that he himself believed every word he stated, and that every experiment he recorded had actually been carried out by himself.

Prof. Webster, of Wooster, Ohio, spoke in complimentary terms of Mr. Fisher's address and said that his information was so valuable because he told us what he had seen with his own eyes, not what he had learned from others. He himself was afraid to recommend crude petroleum for general use as he had known of several instances of injury to trees, but doubtless many successful experiments had been put on record.

A general conversation then took place on the subject of the San José Scale, and all united in the belief that the attack upon our fruit-trees is a most serious one and that the owners of orchards in the infested districts should be warned of their danger and urged to take prompt and effective measures for the repression of the pest. A hearty vote of thanks was given to Mr. Fisher for coming to the meeting and affording so much useful information.

EVENING MEETING, WEDNESDAY, NOV. 14TH.

The meeting was called to order by the President, the Rev. Dr. Fyles, who spoke of the successful gathering the night before when we joined with the London Horticultural Society in a most popular and most interesting meeting. It was quite proper he thought that the consideration of Horticultural topics should take precedence of Entomological, for Adam tilled the garden of Eden before the animals were brought before him to be named. He then gave some amusing instances of the tremendously long names that some of Adam's entomological descendants had been inflicting upon innocent species of insects.

ANNUAL ADDRESS OF THE PRESIDENT.

BY THE REV. T. W. FYLES, D. C. L., F. L. S., SOUTH QUEBEC.

At our annual meetings, Injurious Insects—their ravages and how to check them, have very properly received a great deal of attention. In a population such as ours, largely engaged in agricultural, horticultural and fruit-growing pursuits, such subjects are of never failing interest; and our economic entomologists when they treat of them are very sure to receive attention. To-night I venture to direct your thoughts to a different phase of insect life, and to operations that are beneficial to vegetation; and I trust that we shall spend a short time pleasantly in the consideration of our insect friends, and the offices they serve for promoting the fecundity and improvement of plants.

Dr. Gray did so much to bring the science of Botany into popularity on this continent, and in Canada our excellent public schools have so effectively taken the subject into the *curriculum* of school-work, that now, when addressing an audience upon the instrumentality of insects for the fertilization of blossoms, it is hardly necessary to dwell upon the various re-productive plant-organs. A few brief statements to put you in remembrance of these will be sufficient on this occasion.

You know then that in the blossoms of a large proportion of plants there are, in the centre of each blossom, first, at the base, the *carpels*, and upon them the *styles* surmounted by the *stigmas*—these are the female organs. Around them are, secondly, the *stamens* or male organs each consisting of a filament bearing an anther containing pollen-grains. When these grains are ripe the anther bursts, and the pollen is scattered by various agencies.

For the fertilization of the blossoms it is necessary that some of the pollen-grains should alight upon the stigmas of the female organs. So alighting they adhere, because of a glutinous exudation from the stigmas; and, in a short time, there descends from each of them a sort of radicle, or very fine tube, which works its way down the style, and through, or between, the integuments, till it enters the micropyle and mingles its juices with those of the ovule. The work of fertilization is then complete, and the ovule produces a seed, which in due time and under favourable circumstances will produce a plant like unto that from which it sprang.

The blossoms of the wild rose, the apple, and the cherry are familiar instances of these bisexual flowers.

In many other kinds of plants there are both male and female blossoms—*staminate* blossoms and *carpellate* blossoms—growing on the same plant. Call to mind a field of Indian corn (*Zea mays*), well planted, well cultivated, and in full bloom. Such a field is a sight to gladden the owner's heart, and to excite the admiration of every thoughtful beholder. The tall plants tower over head, each surmounted by the graceful panicle of male blossoms, the anthers of which dangle like bells from the sloping roof of a Chinese pagoda, and scatter the dust of pollen at every puff of air or other disturbance. Below bursting from their leafy wrappers are the stigmas of the carpellary blossoms spreadin like tassels of pale green silk to catch the pollen that descends. No bees meddle with these anemophilous blossoms; and it will be observed that they possess none of those things which attract insects, viz, bright colours, nectar and perfume.

Usually the seeds of pumpkin (*Cucurbita pepo*) are sown here and there among the corn, and the plants from them trail far upon the ground. The flowers of the pumpkin also are of two kinds, male and female, growing upon the same plant; but it is evident from the nature and position of the plants that the wind cannot effect pollination in their case: the agency of insects is necessary; and the blossoms are large and showy, and well designed to attract the bee.

Again in numerous instances the male blossoms grow upon one plant, and the females upon another of the same kind. Every grower of hops knows that for successful cultivation he must have male plants intermingled with the female. The proportion is, if I remember rightly, one in ten, or one in twelve.

The willow and the poplar are familar examples of plants of the kind we are speaking of. Who has not rejoiced to see, in the early spring, the golden catkins of the male willows, for they are tokens that "the summer is now nigh at hand?"

The country-people in the south of England call the flower-laden branches of the willow "palms," for the blossoms come about Palm Sunday; and in olden times branches laden with them were carried to the churches, to represent the palms carried before our Lord on his triumphal entry into Jerusalem. In this word *palms* so applied we have a local popular name that would puzzle any to whom the circumstances of its application were unknown. And, with reference to this, if I may digress for a moment, I wish to point out that Mrs. William Starr Dana in that bright and useful little work entitled "How to know the Wild Flowers" has made a curious mistake for want of a little old-country "folk-lore." On page 124 she takes pains to shew that the word Marigold comes from "the Anglo-Saxon *mere* a marsh" and that the whole name may signify *marsh-gold*. Which (she says) "would be an appropriate and poetic title for this shining flower of the marshes," (p. 124). But Marigold simply means Mary-gold—the flowers of *Caltha palustris* having been used by our forefathers to garnish the churches on Lady Day (March 25th), just as the Pasque Flower was used at Easter, and the Michaelmas Daisy on the Feast of St. Michael and All Angels (Sept. 29th).

> "The Michaelmas Daisie among dede weeds,
> Blooms for St. Michael's valorous deeds,
> And seems the last of flowers that stood
> Till the feste of St. Simon and St. Jude"—

says an Old English Kalendar. But to return—

The willow-blooms are pollinated by means of insects. Small bees of the genera Andrena, Osmia, etc., as well as the honey-bee, frequent them in the day time, to obtain bee-bread for their young and nectar for their own delectation; and in the dusk of the evening hibernated noctuids resort to them for refreshment.

It is a common thing for European Entomologists to spread a sheet under the willow boughs at night, and then by a sudden jar upon the limbs to bring down a shower of moths. The drowsy insects lie inert whilst the operator with the aid of a lantern selects from them such as he fancies.

All these insects fly from flower to flower and from tree to tree and convey the pollen from the male to the female blossoms.

The poplars also are of two sorts, male and female—the staminate flowers growing on one and the carpellary flowers on the other. But in this case the blossoms are of unattractive colouring. They have no nectaries; and the pollen is light and dry. The wind is the agent of pollination in this case.

We have glanced then at three kinds of blossoms:—

Perfect—in which stamens and carpels grow in the same flower.

Monœcious—distinct male and female blossoms growing on the individual plant.

Diœcious—one plant producing male blossoms only, and another only females.

We have also noticed two means of pollination—(1) the agency of insects; (2) the agency of the wind. In some kinds of bisexual blossoms self-pollination takes place, as in the Mallow; but with these we have not now to do. Our attention is to be given to the insect-pollinated flowers.

Of the importance of cross-pollination—*i. e.* of fertilization with pollen from other blooms of the same sort, we may judge from the arrangements made in nature to secure it.

(1) First we notice the wonderful abundance of the pollen—sufficient for every requirement. Take your stand by an apiary towards evening, and watch the returning bees. How laden they are with bee-bread—which is compressed pollen—and yet in the course of their operations they have been instrumental in fertilizing thousands of blossoms. Yes, the busy workers have discharged their duties, and have not been stinted in their reward.

(2) We find that the various arrangements of the floral leaves, or perianth, for the shelter and preservation of the pollen are worthy of observation. Take that common flower the Dandelion (*Taraxacum officinale*). This flower is in reality an inflorescense consisting of a hundred or more flowerets packed together. This collection of small blossoms is surrounded by a green involucre—the whole forming a capitulum which closes tight on the approach of rain.

In the Sun-flower (*Helianthus annuus*), the capitulum bends over in wet weather; and the moisture is shed from the roof-shaped receptacle and the sheltering disk flowers.

In many of the lilies, the corolla forms a bell-shaped roof under which the re-productive organs lie in safety; and in the snap-dragon and other flowers of like structure they are shut up as in a cabinet—a cabinet which the bees know how to open.

(3) We learn that the relative positions of the various organs in many instances render self-pollination impossible.

The English Primrose (*Primula vulgaris*) affords us an instance of this. The flowers of the primrose are of two kinds. In one the style rises higher than the stamens, in the other the stamens are placed above the style. In either case the stigmas are at the same height as the anthers in the other. An insect comes to a flower which has a long style; its proboscis at a certain part is charged with pollen from the elevated anthers of a blossom which it has just left. As the insect rifles the long-styled flower of its sweets this pollen is brought in contact with the stigma which is at the right height to receive it. At the same time the proboscis of the insect is acquiring a fresh supply of pollen lower down from the short anthers and this it will convey to the next short-styled primrose blossom that it visits. It is *possible* that the short-styled flower may be self-pollinated; but it is quite impossible that the long-styled flower can be so.

(4) We see that the ripening at different times of the anthers and stigmas of some kinds of blossoms insures, with the aid of insects, the cross-fertilization of blossoms.

The Monk's-hood (*Aconitum napellus*) affords us an example of this. The blue flower of the monk's-hood is really the calyx. Its uppermost sepal forms a sheltering hood in which the two posterior petals are hidden. These petals are of a remarkable shape, curved and clawed, and they secrete nectar which attracts the humble-bees. The monk's-hood is exclusively a humble-bee flower. The other petals are either wanting or are insignificant. In a newly opened monk's-hood flower the numerous stamens protrude and their anthers ripen before the stigmas. A humble-bee alights in the middle of the flower, holding on by the side sepals. In its struggles to reach the nectaries, the under part of its body is brought in contact with the anthers and becomes charged with pollen.

In the older blossoms of the monk's-hood the stamens all bend back out of the way, and the carpels are protruded. A bee alighting on such a blossom brings pollen to the stigmas now ready to receive it and the blossom is fertilized.

Another noteworthy instance of a plant which ripens its anthers and stigmas at different times is afforded by the Foxglove (*Digitalis purpurea*). The foxglove like the monk's-hood is a humble-bee flower. Indeed its form and size seem especially adapted for the reception of the humble-bee. The stamens and pistil are extended along the upper part of its inner surface. A humble-bee backing out, after sucking the nectar from the further recesses of the flower, scrapes off, by means of its bristly coat, the pollen from the anthers, and carries it on its back to other foxglove blossoms whose stigmas are ready to receive it.

The result of cross-fertilization seems to be the production of more numerous and finer seed, and eventually of stronger and more beautiful plants.

Some flowers have a wide circle of insect attendants. The Buttercup is known to be visited by more than sixty different kinds of insects (Percy Groom's *Elementary Botany*, page 121). Others are exclusive, permitting only the visits of a favoured few

We have seen that the willow catkins are pollinated by bees and noctuids. The flowers of the Blueberry (*Vaccinium Canadense*) are fertilized by wasps which resort to them in great numbers. The round head and short lingula of the wasp fit well into the shallow saucer-like blossom.

Another plant that is visited by wasps is the Kalmia (*Kalmia angustifolia*). This also has shallow blossoms which have this peculiarity, each stamen is sunk in a groove the shoulder of which confines the anther. When an insect in search of nectar butts against the centre of the flower the stamens with their anthers are set free and start forward, scattering pollen on the front of the intruder. This pollen is carried by the insect to other blossoms of the sort and fertilizes them.

In early summer the Lilac blooms are visited by long-tongued moths, such as *Amphion nessus* Cram., *Hemaris thysbe* Fabr., etc., which fly in the daytime. In the dusk of the evening the white-blossomed perennial Phlox invites the larger hawk-moths, *Sphinx chersis* Hubn., *S. Kalmiæ* A. & S., *Deilephila chamænerii* Har., etc. The flowers of the Dogbane (*Apocynum androsæmifolium*) are favourites of moths of the genera Plusia and Thyatira.

Of the butterflies *Argynnis myrina* Cram. has a partiality for Golden Rod (*Solidago Canadensis*); *Pyrameis cardui* L. for Red Clover (*Trifolium pratense*); *Satyrus alope* Fabr. and *S. nephele* Kirby for the blossoms of *Asclepias cornuti*; *Pamphila Manitoba* Scud. for *Solidago lanceolata*, and so on.

In the Society's Annual Report for 1899 I gave the life-history of a small moth *Metzneria lappella* Zel. newly introduced from Europe. It is a burdock insect. Its larvæ feed on the seeds of the plant, and the moth itself feeds from and fertilizes the burdock flowers.

The flower-head of the Burdock (*Lappa major*) contains about forty flowers. They are compressed in a globular involucre, the imbricated scales of which are coriaceous and tipped with awl-shaped hooks. The calyx in each flower is represented by a dense circlet of delicate, white, silky and branched hairs surmounting the seed vessel. The corolla consists of a white tube half the length of the blossom, and then of a vase-shaped, purple expansion, five-cleft at the top. The brownish purple anthers are united and form a tube which produces pollen on the inner side. Through this tube when dehiscence occurs the pinkish white style forces it way, carrying with it the delicate, white, pellucid pollen-grains. The style then parts at the top into two branches which bear the stigmas on the upper surface. An insect carrying pollen-grains from other flower-heads intrudes among the flowerets and leaves pollen-grains attached to the stigmas. In its efforts to reach the nectaries of the flower it dislodges pollen from the freshly protruding styles and then bears it away to fertilize other blossoms.

The Evening Primrose (*Œnothera biennis*) is the special plant of *Alaria florida* Gn. The moth fertilizes the blossoms and is sometimes wrapped in the closing petals on the approach of day. Its larvæ feed upon the plant.

The honey-bee fertilizes the white clover and the humble-bee the red. Grant Allen in "Flash Lights of Nature" has drawn attention to the fact that as the flowerets in a head of clover are fertilized they droop over out of the way so that the bees may not be hindered in their work by vain endeavours.

Another flower that is pollinated by bees is the Nasturtium (*Tropæolum majus*). Three of its five showy petals at a certain distance within are set with a protective fringe, a veritable *chevaux-de-frize* to keep out small insects which would rob the flowers of its sweets and accomplish no good purpose. When a bee of sufficient weight enters, it bears down this fringe over the anthers, and at the same time comes in contact with the advanced style, the stigmas of which become charged with pollen which the bee has brought from other nasturtium blooms. The bee passes into the recesses of the flower, to imbibe the nectar accumulated in the spur, and as it does so the fringe and the stamens rise to their normal position. Having exhausted the supply of nectar, the bee backs and turns to make good its escape, and in its efforts to do so is covered with fresh pollen from the anthers of the flower.

The Campanula grown in our gardens (*C. medium*) has an interesting lesson for us.

The long flower-bud, yet unopened, encloses the tall pistil, along which the five filaments with their long anthers are extended. When the anthers dehisce the pollen masses here to the style leaving about a quarter of an inch at the top free. This projecting part contains the five stigmas. As soon as the corolla opens the anthers shrink away from the style and shrivel up, leaving the pollen masses behind them. At the same time the five sections of the style part, and curl up ram's horn fashion.

Now comes the bee as the minister of Hymen. In this case it is *Megachile scorbicularis* Smith. The insect comes with its abdomen thickly coated on the under side with pollen from other blossoms. As it passes into the flower to get to the nectaries below some grains of the pollen with which it is already charged are scraped off by the curled stigmas and adhere to them. The bee secures a further supply of pollen; but as it passes out of the blossom the under surfaces of the parted style take nothing from its fresh burden. Successive visitors completely clear away the pollen from the pistil.

The small pale flowers in the umbels of the Wild Carrot (*Daucus carota*), the Water Hemlock (*Cicuta maculata*), the Cow Parsnip (*Heracleum lanatum*) etc., are resorted to and fertilized by a very host of small flies and ichneumons.

The English Arum (*Arum maculatum*) also is fertilized by flies. The whole process of its pollination is described in that admirable work, Percy Groom's "Elementary Botany," published by Bell & Sons, London—a work which I can strongly recommend. The story is most interesting. The flies, covered with pollen from another arum, are drawn to the newly opened spathe by an ill odour which it gives out. They creep down the inside of the spathe through a palisade of fibres which grows from the floral axis and closes in a lower chamber—a veritable fly-trap. In this chamber around the floral axis grow, at the base, a number of sessile ovaries with sessile stigmas; above them is a zone of sessile anthers. The imprisoned flies fertilize the ovaries with the pollen they have brought in, living the while upon nectar given out by the stigmas. Then the anthers above them ripen, and they become dusted with new pollen. When this is done, the enclosing fibres wither, and the flies escape to be again attracted by unpollinated arums.

The Skunk Cabbage (*Symplocarpus fœtidus*) and the Carrion Flower (*Smilax herbacea*) are mal-odorous Canadian plants that are fertilized by the aid of flies. Thoreau compared the smell of the latter to that of "a dead rat in a wall." Happily such plants are few in number and grow in out-of-the way places, or retain their offensive odors but a short time. They should serve to make us thankful—they tell us what might have been if God had not adapted the earth so favourably to the requirements and tastes of the children of men. In His great goodness He has filled it with beautiful forms and exquisite colours and harmonious voices and rich perfumes.

Asa Gray in his excellent little school-book entitled "How Plants Grow," has given reverent expression to some great truths. On page 96 he says:—

"Such a system" (The Natural System) "is not a mere convenience for ascertaining the name of a plant, but is an illustration, as far as may be, of the *plan of the Creator* in the vegetable kingdom. And the Botanist sees as much to admire and as plain evidences of design, in the various relations of the plants to each other (i.e. in their resemblances and their differences), as he does in the adaptation of one part of a plant to another, and in the various forms under which any one organ may appear. The different kinds of plants are parts of a great whole, like the members of a body or the pieces of an harmonious but complete edifice or structure; and this whole is the *Vegetable Kingdom.*"

Yes! And when the student considers the bearing of the insect tribes upon this Kingdom, he finds yet further evidences of design, he sees yet more to admire, for he obtains a wider view of the plan of the all-wise and beneficent Being whose hand hath made all these things.

> "The great Creator condescends to write
> In beams of inextinguishable light
> His names of wisdom, goodness, power and love,
> On all that blooms below, or shines above;
> To catch the wandering notice of mankind
> And teach the world if not perversely blind
> His gracious attributes, and prove the share
> His offspring hold in His paternal care."
> COWPER, "*Hope*."

The Rev. Dr. Bethune moved a vote of thanks to the President for his valuable and interesting address which had afforded much pleasure and instruction to all present. Mr. Dearness, in seconding the motion, drew attention to the fact that the beautiful diagrams exhibited in illustration of the address were drawn by Dr. Fyles himself, who thus shewed that he was no mean artist, as well as an eminent entomologist and botanist. He then spoke of the method of fertilization of nasturtiums, and said that he had formed a different theory from that put forth by the President, and would now look forward to further investigations of the case. Mr. Bowman heartily supported the motion, and took occasion to speak of the danger many people incurred from their ignorance of the distinctive characteristics of poisonous fungi, mentioning the case of one that he had gathered this autumn, the immature specimens of which were destitute of the disagreeable odour belonging to the plant.

A PLEA FOR THE SYSTEMATIC AND ECONOMIC STUDY OF THE FOREST INSECTS OF ONTARIO.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

Ontario has an immense area of forest lands composed of hemlock, spruce, tamarac, balsam and pine. According to a recent report of the Forestry division of Ontario, "Of the 142 millions of acres comprising the province, about 120 millions of acres are still owned by the crown. Out of this, nearly 22,000 square miles, or 14 million acres are under license to lumbermen." The Government has very wisely done much to preserve these valuable domains from destruction by fire, by the appointment of a large number of rangers, who patrol, as it were, the forests and put out fires which may have been carelessly started by Indians, campers, or settlers.

There is, however, a danger, perhaps as serious as that of fire, against which no precaution has been taken. I refer to the danger of insect depredations.

Ontario is falling behind many of the neighboring States of the Union with respect to the great problem of the relation of insect work to our forest domains. Much work is being done by the Federal Government at Washington, and by many of the States where extensive forests exist, in determining the conditions which increase or decrease the extent of insect ravages. Already extensive experiments have been carried out, and much valuable information has been secured. The investigations have found that the amount of damage caused by insects in the large forests is enormous; and to prove that their results are worthy of consideration the very persons who are most directly interested in the preservation of the forest timber, the great lumber and timber companies, have readily come forward and assisted the investigator by affording every facility in the forest for a thorough study, and by money contributions as well.

In Europe every trained forester is well informed with regard to forest insects and knows how to combat their attacks; but in Ontario we are content to go along in our ignorance and pay no heed to insects or their ravages, probably because our forest areas are so large.

The questions will naturally be asked: "In what way can a study of forest insects help us in the preservation of our forests?" and "How can assistance be rendered in cases of serious insect ravages?"

In answer to the first question it may be said that a knowledge of the life histories of injurious forest insects is just as essential to a proper, intelligent campaign of operations as is a knowledge of life histories in our work against the foes of the orchard and garden. Systematic work must precede intelligent economic work; we must distinguish the economic forms from the beneficial or harmless species. In many cases it may be possible to utilize the beneficial forms as allies against the injurious forms, and in a well developed plan of operations the beneficial insects should be preserved from destruction.

I maintain, then, that a systematic collection of forest insects should be made so that we may become familiar with the forms; that a series of observations be made so that the life-histories of as many as possible be obtained for our guidance in combatting the injurious forms.

In answer to the second question proposed it may be said that hopeful results have been secured for American conditions of forestry which are so very different from those obtaining in Europe. In Europe the forests are carefully guarded, and a semi-military system of protection is in vogue in most of the continental countries.

In West Virginia it has been found that there is a proper time to fell trees to prevent damage by insects. Dr. Hopkins cut different kinds of trees twice a month year after year, and he got definite results for the oak and hickory for example. The timber cut in the winter months was gradually converted into a powder, while that cut during the summer remained almost intact. These results are confirmed in the practical operations in the forests, for it has been observed that certain species of trees felled in late fall, winter, or early spring suffer more damage than those felled in July and August.

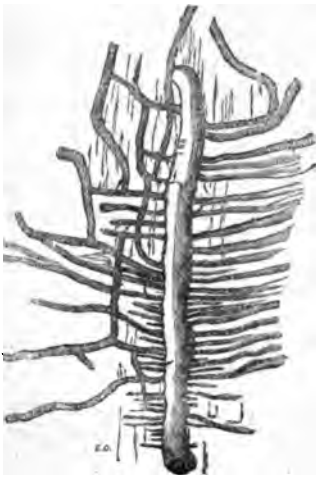

FIG. 1. Hylurgus piniperda.

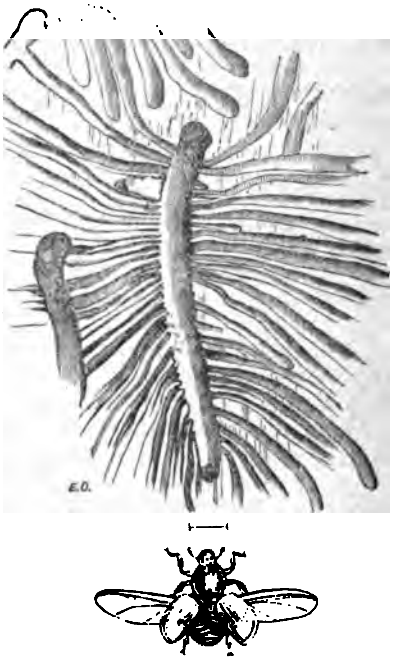

FIG. 3. Scolytus destructor. The beetle, magnified, and its burrows. (See page 72.)

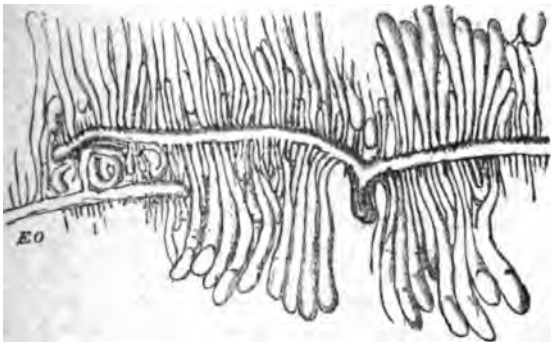

FIG. 2. Hylesinus fraxini.

Again, much has been learnt regarding the disposal of timber which has become affected, and the influence of lumbering methods and forests fires on the general problem of insect depredations. It is a matter of observation that unhealthy, weakened, dead trees are the most likely ones to suffer from insect attacks. Thus careless methods of handling timber whereby standing trees are girdled, branches broken, and otherwise dismembered and disfigured, are very fruitful sources of insect distribution to those areas. These infested areas become centres of infestation to the surrounding forest.

In Ontario where lumbering operations are carried on in many isolated limits the danger is extremely great. The trees along the margin of the felled areas are very liable to lose their vitality on account of their inability to adapt themselves to the changed conditions which have arisen. If the lumbering operations are postponed for any length of time there is a great likelihood that the insects will spread from the felled areas to the unbroken forest, but where lumbering is carried on continuously in an area the insects find sufficient new-felled timber and branches without betaking themselves to the unbroken forest.

The plan of forest-ranging for the prevention of fires is undoubtedly of tremendous value in the prevention of the spread of forest insects, but there is another work for the ranger. He could, if he knew more about insect conditions and habits, arrange for the burning of certain felled areas at a time which would be the most favorable for the destruction of the insects which are preying upon the dead and dying trees. Such burnings, however, should be very carefully controlled so as not to injure the trees of the untouched forest, lest new feeding grounds be opened up for the insects.

Indirectly, again, the control of forest insects is of much importance. Dr. Hopkins, after a trip through the great north-west timber lands of Washington, Oregon and Idaho, states that his observations prove conclusively that forest fires originate, in very many cases, in timber areas which have been killed by insect depredators. The dead trunks and broken branches furnish suitable conditions for the rise and spread of fires.

The entrance of trunk and bark beetles into the trunk and bark of trees allows access to many timber fungi which penetrate the tissues, sap the vitality of the trees, and eventually kill them. The accompanying figures, 1, 2 and 3, illustrate the manner in which some common timber beetles burrow along the wood beneath the bark Recent studies by European and American mycologists show very clearly how very prevalent, as well as harmful, fungous diseases are in the forests. It is quite true that insects often attack healthy trees, and fungi gain entrance to trees which have not been attacked by insects, yet the fact remains that the presence of insect pests increases very much the harmful effects of fungi.

In answer, then, to the second question asked regarding the assistance which a knowledge of insect conditions can give towards the control of forest insects, it may be said in summary that much can be done (1) by cutting and felling timber at the most advantageous season; (2) making traps for insects by girdling and felling trees to which the insects are attracted in preference to sound trees, then by careful burning of these traps; (3) preventing the cutting of timber in many parts of a limit, as these parts serve as centres of infestation; (4) preventing careless methods of handling the unfelled trees so as not to injure them and thus to expose them to insect attacks; (5) preventing fires which we know destroy many trees and render them subject to insect attacks; and (6) introducing insects which prey upon injurious forms.

We are not in a position at the present time to carry out all of these methods, for we are ignorant of the life-histories and habits of the majority of the forest insects. Accordingly, I make a plea for the better studies of insects, and such can be best accomplished by a biological survey of the great timber areas of the Province. Such a survey must naturally be undertaken by the Government, assisted, if possible, by the holders of timber limits from the Crown. It is the duty of this Society to call the attention of the Government to the necessity for such a survey.

Professor Packard states in his valuable report on the Forest Insects, published in 1890, that "the number of insects which attack the different kinds of trees in the United States is sufficiently large to excite great fears for the future prosperity of our diminished forests, unless the Government interposes, and through the proper channels fosters entomological research in this direction. Our forests, moreover, are much richer in species of trees than those of Europe. We have, without doubt, on the trees corresponding to those of Europe as many destructive species as in Europe. But we have many more shade trees and forest trees of importance in the Eastern United States alone, and when we add to these the forest trees of the western Rocky mountain plateau and of the Pacific coast, and when we look forward to the attention which must be given in the immediate future to the planting of shade and forest trees on the great plains and in California, the subject of forest entomology assumes still more importance."

According to Kaltenbach the number of injurious insects which attack the forest trees of Central Europe is as follows:

Oak	537	species
Elm	107	"
Poplars	264	"
Willows	396	"
Birches	270	"
Conifers	299	"
Beech	154	"
Alder	119	"

It is apparent that neither the officials of the Department of Crown Lands of Ontario nor the members of the Royal Commission on Forestry Protection in Ontario consider that insects do any injury to the forests, for in the report issued a few months ago, the insect problem is not even mentioned. Such an omission must be an oversight, due, no doubt, to the fact that none of the members of the Commission are entomologists. It would, indeed, be strange if our Ontario forest domains of such great extent form an exception to the general rule, and harbor no insects.

Dr. Fyles remarked that this paper dealt with a very important subject which deserves the serious consideration of the community. He then referred to the large areas in the Province of Quebec which had formerly been covered with forests of tamarac, but now were desolated by the ravages of the Larch Saw Fly and the timber rendered worthless.

Dr. Fletcher stated that the lumbermen usually say that in the Ottawa valley alone insects cause them a loss of a million dollars annually. This amount is merely an estimate, but it serves to show that they are aware of the losses caused by insects and realize how costly their ravages are. It is found that if the logs cut in the winter are not got into water, they will surely be attacked by insects and badly injured during the summer. A plan adopted in many cases is to turn the logs over from time to time during the summer so as to change the position of the portions exposed to light and those in contact with the soil; another method is to split the bark so that the inner part dries up and prevents the insect larvæ from living in it. These operations, however, are difficult to carry out, as the lumbermen cannot stand the flies which attack them in myriads during warm weather; this cause also prevents them from cutting timber in summer, which has been proved to be a better time than winter as far as the quality of the timber itself is concerned. The attacks of insects are always made upon dead or dying trees and such may usually be found on the edges of clearings where partially injured trees have not been cut down. In 1884 there was a great forest fire in the Ottawa valley, which left an immense number of burnt trees still standing. These were immediately attacked by insects and the loss would have been complete had not the owners of the timber limits at once set to work to cut and remove as much as possible of what was left. Any tree that is scorched with fire or partially burnt is sure to be attacked by wood-borers during the following summer.

Dr. Fletcher closed his remarks by moving a vote of thanks to Prof. Lochhead for his interesting paper; this was seconded by Mr. Dearness, and carried unanimously.

RESULTS OF SOME EXPERIMENTS IN PROTECTING APPLES FROM THE ATTACKS OF THE SECOND BROOD OF CODLIN MOTH.

By F. M. Webster, Wooster, O.

In Ohio, our attempts to protect the apple crop from attack by the codlin moth have given us varying results. Some years, spraying with the arsenites like Paris green, London purple and arsenite of soda have given excellent protection, and the apples have been very free of larvæ. Other years, though the spraying has been done with equal care and in proper season, the effect has been discouraging, to say the least. The causes for these varying results are not at all clear and there are some grounds, during some years, for the question as to whether, or not, it pays the orchardist to go to the expense of two or three sprayings and get so little in return for his labor, and other necessary expenditures, which spraying necessitates. Frequently the apples will pass through the season, up to late August, without exhibiting indications of the work of the apple worm, but after that the fruit seems to be seriously attacked and much damage done. There are with us, two periods of dropping of the wormy fruit. The first in late July and the fore part of August and the second setting early in September. Orchardists have declared that they could prevent the first, very largely by spraying, but the second baffles them. I have suspected, for a long time, that this was due to the attack of the second brood, and those who succeeded in protecting their fruit early in the season were, very largely, suffering from the results of moths developing in unsprayed orchards, and migrating during August to those that had been carefully and properly sprayed, thus infesting these after it is possible to protect them by the usual measures. In order to test the probable efficiency of spraying, during the ordinary season for doing this, an experiment was tried in the orchard of Mr. William Miller, at Gypsum, Ottawa County, along the southern shore of Lake Erie. It was obviously impossible to get two trees exactly alike, and not easy to secure two greatly alike in close proximity to each other, but we selected two well in from the outer margins, and one of these we covered with netting, such as is used for covering baskets of peaches and grapes. The trees were sprayed for the last time on June 22nd and the covering applied the next day.

All fallen apples were removed from under both trees on August 29th, while there was a cessation in dropping of infested fruit, and, as we thought, all or nearly all of the first brood were thus eliminated. On September 14th, soon after the terrible wind that swept over the lake region, the spent tropical hurricane that devastated Galveston, Texas, there were removed from under the covered tree 229 apples, 59 per cent. of these being sound, their weight being 77 pounds. Under the uncovered tree there were 1,052 apples, only 10 per cent. of which were sound, and their weight was 214 pounds.

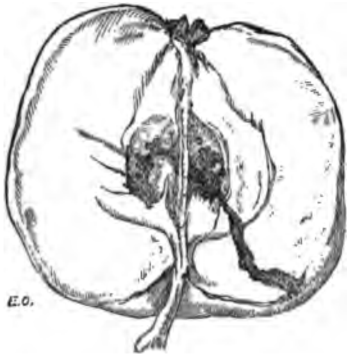

FIG. 4.

October 22nd, there were picked from the covered tree 107 pounds of fruit; 372 apples were sound and eight wormy. Windfalls, 18, all wormy. From the check tree there were picked 128 pounds of fruit, 253 apples being sound, and 41 wormy. Of the windfalls, 94 were sound and 104 wormy. (Fig. 4 illustrates the familiar appearance of a "wormy" apple.)

Recapitulating, the covered tree, after the fruit was removed from beneath on August 29th, carried 627 apples. Of these, 372 were gathered in a sound condition and 26 were wormy. The uncovered tree, after fallen fruit was removed on August 29th, carried 1,544 apples, of which 347 were sound when gathered and 145 were wormy. The summary would read thus: Covered tree, out of 627 apples, gave 466 sound and 161 wormy; the uncovered tree, out of 1,544 apples, gave 452 sound and 1,092 wormy. This, I think, shows pretty clearly what the result would be if we could manage the second brood of moths, and also who is to blame for the disastrous effects of the second in well sprayed orchards.

There are two other points worth mentioning First, where a species is double brooded, the second brood is likely to be the most migratory in habits. Second, it is the outer rows in a well sprayed apple orchard that are most affected late in the season. Taking it altogether, the trouble does not appear to be with the spraying, but with those who do not spray at all, and who furnish the migrating female codlin moths that give origin to the second generation of worms in a well sprayed orchard.

In the discussion that followed the reading of the paper, Dr. Fletcher stated that he had that day seen a young larva about a week old, which evidently belonged to a third brood. It seemed clear that the best method of counteracting this insect was to spray for the first brood and bandage the trees for the second.

Mr. Bowman asked whether a late hatching of a third brood would not be a good thing, as then they would probably all be winter killed. Prof. Webster replied in the affirmative, and said that some years ago there was a severe frost in June, which nipped the leaves of the trees. Olisiocampa caterpillars had been very abundant, but they all perished from frost or want of food, and it was years before they became numerous again.

Dr. Fletcher mentioned that he had received some cocoons of the Tussock moth from Toronto, covered with eggs. They all hatched out recently under cover, shewing how near this species is to being double-brooded.

The next paper read was by Mr. Arthur Gibson, Assistant Entomologist of the Experimental Farm at Ottawa, on the "Life-history of Arctia Phalerata," in which he described in detail all the stages in the life of this insect from the egg, through the caterpillar and pupa to the perfect insect. As it was of a highly technical character, the paper has been published in *The Canadian Entomologist.* (Vol. XXXII., p. 369.)

Dr. Fletcher, at the close, remarked that such a paper as this indicated the lines upon which the best work should be done. It had been prepared with the utmost care and minute observations had been made at every stage of the insect's life. It was very important that life histories should be worked up in this way, as the imagoes alone are not to be depended upon in the separation of species. Very little is known about some of the commonest insects, and regarding others futher details are required to fill up the blanks in our knowledge. Every Entomologist should try to rear at least one species every year, and then a very great deal would be accomplished in the course of a comparatively short time. He then spoke of the mode of describing a larva, and explained Dr. Dyar's plan of numbering the tubercles and thus simplifying very much the work of description.

NOTES ON INSECTS OF THE YEAR 1900.

DIVISION NO. 2—BAY OF QUINTE DISTRICT.—BY J. D. EVANS, TRENTON, ONT.

During the past season the Forest Tent Caterpillar (*Clisiocampa disstria*) has done much damage in certain districts but not to such an extent as last season.

Grasshoppers caused some destruction to grain and pasture in some localities in the northern portion of the County, but only over comparatively small areas.

The pea weevil (*Bruchus pisi*) has come to be such a pest throughout Prince Edward County, that the seedsmen are looking for other and more suitable localities, in one case having transferred their operations in part to Lindsay.

The larvæ of *Phytonomus punctatus* were observed to be quite numerous in a clover field at Lake on the Mountains, near Glenora, Prince Edward County, on the 24th of May last. In very many cases the larvæ were curled up and encircled the tip end of the blades of grass, and apparently in a dying condition from either being parasitized or from some disease. At the same time and in the same clover field a number of examples were taken of *Hylesinus trifolii*, Muell. also eleven specimens of *Phytonomus nigrirostris*, Fab.

In July last unusual visitors appeared in a pear orchard owned by Mr. W. A. Warner and situated about 2 or 3 miles to the north-west of the town of Trenton. This orchard was about one acre in extent, in the midst of an extensive apple orchard, and had a few plum trees interspersed through it. About the third week of the month all the pear trees had their lower limbs swarming with small green caterpillars, there was no web nor did they suspend themselves by a thread, but seemingly dropped to the ground when satiated or when the tree was struck, then crawled towards and up the trunks again to the higher branches. The trunks of the trees and the ground, in places, were fairly green with the crawling masses of them. The caterpillars were from ½ to ¾ of an inch long when first noticed, of a dark green colour at one end and a lighter green at the other. The apple trees in the immediate vicinity had a few of the caterpillars but the plum trees were not visited by them. A thorough spraying destroyed them all. It was not until about two months thereafter that the writer became aware of their visit through a letter from Dr. Fletcher. The above particulars having been procured from Mr. Warner at such a long interim from their appearance, further information could not be elicited.

There has been a great scarcity of moths during the past season as compared with last, very few coming to light and they only of the commonest species.

DIVISION NO. 3.—TORONTO DISTRICT.—BY D. G. COX, TORONTO.

Owing to other duties the writer has had very limited opportunities for observing the insect ravages of this district during the past season.

The Tussock Moth (Orgyia leucostigma) is still with us and has caused considerable damage to the foliage of the horse chestnuts in some localities. The civic authorities did considerable spraying of the foliage in the early part of the season which no doubt destroyed the young larvæ in large numbers. The pest appears to be diminishing and if they keep on fighting it, they will eventually succeed in getting it under control.

The Tent caterpillar (Clisiocampa Americana) was in considerable numbers on the wild cherry trees around the suburbs of Toronto, and many orchards were rendered unsightly by the tents. The Cabbage Butterfly (Pieris rapae) has been unusually numerous this year in this locality, and the cabbage and cauliflower crop in many gardens has consequently been considerably damaged by the larvæ of this common pest. The cabbages were so badly perforated by the caterpillar as to render them unmarketable. I observed also in gardens where no cabbages were grown, that the turnips and radishes were severely attacked by this larva.

During a trip taken through Scarborough and Markham townships in the latter part of July, I visited several farms and found considerable damage had been done to the turnip crop by what appeared to be the larvæ of (Noctua C-nigrum). In some fields 40 per cent. of the crop had been cut off and the farmers were re-sowing seed in the bare places along the rows that had been destroyed. I did not know the best remedy to recommend to prevent the ravages of this cut worm, but advised them to apply to Dr. J. Fletcher, the Dominion Entomologist at Ottawa, who would give them valuable information which would be of great benefit to them in combating the ravages of the insect.

Around one of the farms I visited there were planted about two-thirds of a mile of European Mountain Ash trees (Pyrus acuparia). These trees were about fifteen years old and were so badly infested with the larvæ of the Flat-Headed Apple Tree Borer (Chrysobothris femorata) that the writer picked from the outer bark of one tree ten young larvæ about five-eighths of an inch long, several other trees were examined in the row and found to be in the same condition. Quite a number of the trees had already been killed by this pest. I advised our friend the farmer to pick out as many of the larvæ as he could during the months of July and August, after that they would have penetrated into the heart of the tree and consequently could not then be reached. I also told him to paint the trees next spring with a thick solution of soft soap and washing soda before the beetle oviposits so that the young larvæ will have difficulty in penetrating the bark. The ravages of this beetle seem to be confined more particularly to the trunk of the tree; from the ground up to the first branch. I found no evidence of larvæ above the first branch in any case.

The Spruce Gall-louse (Chermes abietis) does not appear to be so abundant in this locality as formerly.

DIVISION NO. 4.—HAMILTON DISTRICT—BY JAMES JOHNSTON, BARTONVILLE.

Want of time during the past season has prevented me from doing but very little insect collecting so that my brief report is mostly made up from my observations on the farm during my daily occupations.

During May and most of June cut worms were very troublesome, being more numerous than I have ever known them to have been. Systena blanda, Mels (the pale-stripped Flea-beetle) has been quite numerous. Eight years ago when I first noticed these little beetles, they seemed to confine themselves almost entirely to rag-weed, but each year since then they appear to be taking to other plants as food, and now they may be considered destructive to turnips, pumpkins and strawberries. Last season a few choice pumpkin seeds were planted and in the course of a short time when I went to see how they were doing I found the plants thickly covered with these beetles making them appear as if sprinkled with ashes, and, on my approaching, they all vanished, being very quick.

July 22nd, Orioceris 12 punctatus, Lin. made its first appearance in our asparagus patch when I took seven specimens. As the season advanced they increased in number so that I fear by next season it will be reckoned amongst our already too numerous garden enemies.

Aug. 17th, Colias eurytheme, Bd. In crossing the clover meadow where C. philodice was very numerous I noticed this orange-colored beauty which I secured with my sun-hat after a hard chase. It is a beautiful large specimen which is of double interest to me as it is the first of the species I have taken, and differs from those in my cabinet by having the front half of the fore wings a pale yellow.

Aug. 30th, Nonagria subflava, Gr. This is the third specimen of what is, as far as I can learn, a rare insect during my years of collecting. I took it in the house having been attracted by the light in the kitchen.

Aug. 31st, Catocala nebulosa, Guen (1 spec.) and C. Robinsonii, Gr. (2 spec.).

These two species I consider an interesting capture as both species are new to my collection and possibly to Canada as I have never heard of them as being Canadian species.

This I should say has been a year favorable for this very interesting genus as they have been unusually abundant in this locality. I missed all the early kinds as I was unable to look after them before Aug. 18th, but after that succeeded in taking seventeen species, amongst them four C. desperata, Guen., of which I never took but one, and it several years ago, and a doubtful specimen, possibly a variety of C. paleogama.

In the early part of the season I noticed that some insects were doing much damage amongst the strawberry plants by eating the heart leaves while young and tender and I was at a loss for some time to discover what they were, but finally I detected a black beetle doing the mischief, and by keeping watch I saw several doing the same thing so I have made up my mind that they are the mischief makers. They straddle the leaf and very soon destroy it as they eat quite greedily.

DIVISION 5.—LONDON DISTRICT.—BY R. W. RENNIE, LONDON.

That most exasperating of all injurious insects, at least to the average gardener, made its appearance last spring in unusually large numbers, viz., the CUT WORM, mostly the larvæ of *Hadena arctica*. There seems to be a considerable amount of uncertainty in regard to the appearance and disappearance of this insect.

In 1895 the moths were flying in immense numbers. The following spring the larvæ did great damage, but when the time arrived for the appearance of the moths, those of us who were expecting a great number, were disappointed, as very few appeared.

Again this year, the larvæ were exceedingly plentiful, but the mature insect, at the time it should have appeared, was in very small numbers. I have not seen any explanation offered for this heavy mortality amongst the pupæ. Remedies proposed:—Placing bunches of grass, clover, etc, saturated with Paris green along the rows. This is of very little use, the young larvæ are not such fools as to eat withered foliage, when they can get the fresh article right at hand. But a mixture of bran and Paris green seems to be very much to their taste, while not neglecting the plants altogether for the bran mixture, they are more inclined to try it than anything that has been proposed up to the present.

CABBAGE ROOT MAGGOT.—This insect has been quite destructive this year, the only remedy so far that has been beneficial has been to wrap the stems of the plants when transplanting with tar paper. In the August number of the "Canadian Horticulturist" there is a suggestion from one of the staff of the Guelph Agricultural College, namely, to try a tablespoonful of carbon bisulphide in a hole at the base of the young transplanted plant. This may prevent the mature insect from depositing her eggs on the plant, but, with carbon bisulphide at twenty cents per pound, and cabbages at twenty cents per dozen, I think that the gardener had better quit growing cabbages. The cost for carbon alone will be about ten cents per dozen plants. The recommendation of such a dangerous insect destroyer as carbon bisulphide I think should be condemned; it may answer very well for laboratory experiments, but in the hands of the general public, may be the cause of numerous accidents, which will result in all probability in a general distrust by the public of trying any new insecticide with the chemicals of which they may be unfamiliar.

RED SPIDERS.—This mite has been very destructive this year to growers of sweet peas. It has got to be such a pest that most lovers of this flower in this section will be forced to abandon their cultivation. Last season, although a grand season for the pea family here, was very short, ending about the middle of August, due almost entirely to the ravages of the red spider.

Cold water spraying is not sufficient to keep them under control. To apply an emulsion you will have to have a pump capable of delivering the emulsion at at least thirty-five pounds pressure.

ROOT APHIS.—This pest appeared in quite large numbers this year attacking sweet peas and asters. I have seen no preventative proposed. Aphides were very numerous this season. I have seen whole fields of cabbages almost entirely covered with them. Spray with kerosene emulsion, or if you have a water pressure of sixty or seventy pounds use water only.

NOTES ON THE SEASON OF 1900.

By J. Alston Moffat, London.

Ravages by cut worms were reported to me from far and near as being unusually severe. And several kinds of moths presented themselves to my notice in conspicuous profusion later on, as probably coming from such worms; such as *Agrotis C. nigrum*, *Mamestra devastatrix*, *Hadena arctica* and several others in lesser numbers, whilst toward the end of the season *Agrotis subgothica* (Fig. 5) was in great abundance.

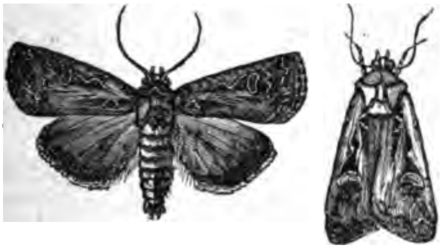

Fig. 5.

A most unusual outbreak of *Crambus exsiccatus* made itself manifest in the early part of June, and lasted well into July. Early on Sunday morning, June 10th, I was walking down the delightfully quiet street, when my attention was attracted by the singular appearance of the pavement in front of me. I thought it was covered with peanut shells, broken up very fine, and fancied some boys had been having a feast on the previous evening, but on reaching the spot I found the strange appearance to be produced by the wings of that moth. I looked up, and there was a restaurant lamp overhead, and the light from it had dazzled the moths and brought them down, when they got trodden underfoot by the travel of the previous evening, until the stone pavement, for a space of eight feet in diameter, was literally put out of sight with their remains. How many deep I could not say. If this was but one of many such "slaughter pits," which it is reasonable to believe was the case, then how little conception one can form of the multitudes of them that were destroyed in one night; whilst it made no perceptible reduction to the numbers left in the fields or at the lights. Then to think of the injury done to crops—grasses mostly—during the feeding up of the larvæ for the production of such swarms of moths, whilst the cause of such injury would be all unseen and unsuspected by those suffering from their depredations.

The notorious "Buffalo Bug," sometimes most misleadingly called "moth," to which it has no resemblance, it being in reality a beetle, *Anthrenus scrophulariæ*, Linn. (Fig. 6 *d*), has become an established pest in London. Early in the year I took the beetle on the windows of the Y.M.C.A. building; and complaints of its depredations were heard from various parts of the city during the summer. About the first of August two larvæ were brought to me by a lady; one seemed full-fed, the other about half grown. The one pupated about the first of September, and gave forth the beetle in October, the other was still feeding at the end of the month, but died before maturing. The larval stage is the only form of its existence known to the majority of housekeepers, which is correctly represented at Fig. 6*a*, greatly enlarged, the line at the side indicating the natural size, and they would hardly believe that the beetle at *d* was the same insect, or one from which they had anything to fear. The beetles are black, ornamented with white and red, but are extremely variable; so much so that three forms have received distinguishing names. It is a European insect, but there it is spoken of as a "Flower Beetle," although known to enter houses and destroy "furs, clothes, animal collections, and even leather and dried plants." It was on this continent that it first obtained its notoriety as a carpet pest, the habit here of tacking down carpets for a year giving it a splendid opportunity to propagate undisturbed; with this, as with others of its kind, frequent

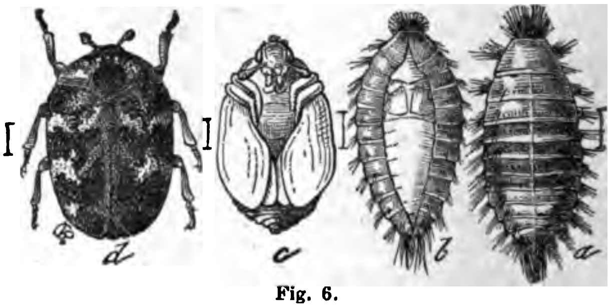

Fig. 6.

stirring up is an excellent means of deterring them from indulging their destructive propensities. And now that it is here to stay, as it is not entirely depending on indoor propagation, so cannot be exterminated except locally, there is nothing for it but to give it due attention; and to combat it successfully, a knowledge of its nature and habits must be acquired.

Having learned to recognize the beetles, they may be seen upon the windows in early spring and destroyed before they have an opportunity to deposit their eggs, and thus prevent future trouble from them. In nature it takes a full year to complete the round of its existence, but with the artificial warmth of houses it matures in shorter time, and beetles may be found on windows before the end of winter.

When once a dwelling has become infested, not only should the carpets be thoroughly beaten, and disinfected, but narrow strips of thin muslin should be fastened over the joints of the floors with varnish before relaying, so as to prevent them secreting themselves there. A strip of tar paper laid under the outer edge of the carpet is an excellent preventative.

When they are known to be at work and it is not convenient to lift the carpet, benzine will kill any living insect that it is brought in contact with, but great care must be exercised in not allowing a light to approach it while it is evaporating, as it is very inflammable. A damp cloth and hot iron will also effectually arrest the operations of any depredators upon whom they are applied. Steam or benzine may also be used to advantage to get rid of their presence in upholstered furniture; by such means can their operations be restrained and rendered comparatively harmless. But constant watchfulness against their presence is required, for even if a dwelling has been freed from their presence during one season, the beetles may enter at the open windows the next summer and start a colony afresh.

There is another beetle with similar habits belonging to the Dermestidæ, *Attagenus piceus*, Oliv., whose larva is about the same size and hairy character as that of *Anthrenus scrophulariæ*, which it closely resembles and might easily be mistaken for, as they are sometimes found associated; but the beetles are quite different in appearance, *Attagenus piceus* being much longer than wide, a flatter insect and entirely black. This also will have to be guarded against, as it is just as destructive a carpet pest as the other, and in some instances becomes the most numerous of the two. For some time past it has been more troublesome in the Society's collection than *Anthrenus varius*, which is supposed to be the standard museum pest.

A friend in the country, in one of his recent letters to me, conveyed the following item of information, which may serve as a warning against the employment of cheap labour: "We got lots of help to thin our turnips this year. Some big green fellows came along who gave us their assistance and worked for their board; but they made a bad job of it. After we had thinned some rows they would go round and thin them over again, and they left nothing whatever in some rows, but that may have been because they worked at night and did not see what they were doing."

During the remarkably fine weather we were favored with during October, winged *Aphis* were in great abundance, and made walking on the streets quite unpleasant, especially where there were shade trees. One evening when the setting sun illuminated the hazy atmosphere and the tiny wings reflected the light conspicuously and made each individual stand out distinctly, I made an effort to estimate how thick they were. By stopping at different points and watching closely, I estimated there was one to every four inches of space. Before they had all gone, those mosquito-like merry dancers (*Culiciformis*, Latreille, some of whose larvæ live in water and others feed on fungus,) made their appearance, who from some inherent perversity of their nature, congregate in living columns over the sidewalks, with their densest portion about the level of one's face, which one must either go through or turn off the walk to get round, when one would think that any other portion of the street would serve the purpose just as well. One warm summer's day, I took a seat in a pleasant shade, put my light colored straw hat on my knee, when one of these groups formed over it and commenced a jig close to my face, some of them striking it. I swept them away several times but they always returned and gathered as before. I began to suspect that the hat was the centre of attraction, so I placed it on the seat an arm's length away, when they immediately formed their dancing party over it there and kept it up until I took it to leave. So it would seem as if they liked to have some conspicuous object beneath them to keep the crowd in line.

There was sent to me by Mr. J. Tanton of this city, a most singular looking creature of the class *Myriapoda*, and shortly after another was brought by Mr. C. E. Abbott, both of them supposed to have come in packing, and had attracted their attention as something quite unusual. From information received by me at our annual meeting, it proved to be *Cermatia forceps*, Rafinesque, of the family Scutigera, and the first reported appearance of it in Canada. There is an excellent figure of it in the fourth report of the N. Y. State Entomologist for the year 1887, page 129, and from that article I have gathered the following information: It is properly a southern resident, but has been gradually extending northward, until it has now become well established in most of the eastern States. Its body is when full grown, about an inch in length, with a uniform width of a quarter of an inch, but rather narrower at the hind end. It has fifteen pairs of long legs which terminate in a black, sharp hook. The front pair of legs are about half an inch in length, the others gradually increasing in length to the second last pair, which are about an inch and a quarter, whilst the last pair are an inch and a half or more. It is known to be carnivorous, feeding upon insects, for which it enters and frequents houses, and when seen for the first time, is sure to attract attention by its grotesque attitude and rapid movements, and may even create alarm; but for which there is no cause, as it is extremely timid and anxious to escape. Yet, from its anatomical structure it is suspected that it may be poisonous, but there is no authentic instance recorded of its ever having inflicted injury to a human being. From Insect Life, Vol. 3, P. 85, I copy the following: "Mr. Webster spoke of the predaceous habits of *Cermatia* and its preying upon the Croton bug. Mr. Fletcher had observed the insect with Mr. Howard, at Washington. Its mode of capturing the Croton bug before devouring it was remarkable. It sprang over its prey which was thus encaged between its many curved legs."

The unusually warm weather in October, had the effect of bringing to maturity great numbers of the Tomato Sphinx, and many were captured on the wing. I secured a fine, fresh specimen on a shop front in the principal thoroughfare of the city on the morning of the 19th.

Anosia Archippus was noticably scarce through the season, as compared with the previous year, and yet Messrs W. E. Saunders and H. Gould saw them on the 19th of September, accumulated in such multitudes on the trees at Point Pellee, as to put the green of the foliage out of sight, whilst the lower branches were drooping with their weight. On the 27th of October, the janitor of the Y. M. C. A., brought me a living specimen which he had taken from a bush, helpless from the coldness of the day; bright and fresh, as if newly hatched. It was very lively in warmth and sunshine, and fed freely, but dormant when the room was cold. On two occasions it remained in the same position from about four o'clock Saturday afternoon, until near noon on the Monday following. On the 13th of November, I allowed it to remain too long on a frosty window, from which it never fairly recovered, and it died on the 16th. It retained its bright colors to the last. It was a female. I opened the abdomen and made a microscopic examination. It was very fat, but I could see nothing whatever to indicate the presence of eggs.

ANOSIA ARCHIPPUS, YET AGAIN.

By J. Alston Moffat, London.

In a series of most interesting and instructive articles on the Migration and Dispersal of Insects, by J. W. Tutt, F. E. S, editor of "The Entomologist's Record and Journal of Variation," London, England, after a reference to the methods of many different insects, he arrives in due course, in the July number, 1900, to a consideration of what has been written upon the movements, spring and autumn, of *Anosia Archippus*, Fab. (Fig. 7) and the claims that have been put forth for it, as differing in many respects from all other butterflies. The opinions that he has formed from a consideration of what has been written upon the subject, and the conclusions he has arrived at upon it, can be gathered from the following extracts taken therefrom:

"So far as one is able to get at the real facts (i. e., apart from the opinions of observers,) one is able to conclude that the movements of *Anosia Archippus*, in North America, are very similar to those of *Pyrameis cardui*, (the Thistle butterfly) in Europe." After quoting from various sources, Mr. Tutt adds: "All these irregularities of habit will be certain to strike one who has studied the subject, as being readily paralleled during a series of years by the immigrants of *Colias edusa* and *Pyrameis cardui*, and their progeny in our own country." That is, Britain.

After quoting a diversity of individual opinions and contentions, he continues, "However little definite information there is about the spring migration of *A. archippus*, a great number of observations have been recorded of a habit that is certainly unknown in any of our most observed Palæarctic migrating species. This is the habit of swarming in the autumn." He then gives a large number of instances that have been observed by different persons, of autumnal swarms passing over various parts of the continent; then continues, "One other observation may be added, that of Bowles, who states that he has himself seen the shores of Lake Ontario, near Brighton, strewn with hundreds of their dead bodies, cast up by the waves, and which no doubt had formed part of a swarm, which from weakness or some other cause had perished while flying across the lake." Then Mr. Tutt sums up his conclusions upon the subject thus:

"From these and similar observations it has been concluded that the swarming of this butterfly in autumn is analogous with that of birds before commencing their flight southward, and that, after swarming, the butterflies return to the sub-tropical lands whence their grandmothers and great grandmothers set out in spring. It is admitted that the climate is such, in the northern territories to which the species annually spreads, that the butterfly cannot possibly exist in the winter, and Riley, who first propounded the return theory, himself confesses that "under the most favourable conditions a large majority perishes." As we have said, Scudder accepts the theory as fact, and practically writes as if it were proved beyond question of dispute. For ourselves, although we know of no exact analogy among butterflies of a similar swarming habit, yet, in every other respect the similarity between the habits of this species and our own European migrating species, *Pyrameis cardui*, *Colais edusa*, etc., is so great, both as to the continuous-brooded habit, and also as to Dr. Thaxter's observation that the males and females in the autumnal swarms pair, that we are inclined to doubt the conclusion. It has never yet been shown that the journey has been successful. The swarms are sometimes noted as going in a different direction from that assumed by the theory, and much more evidence is necessary before even an approximation to success can be admitted. For ourselves, we doubt whether the return journey has ever been successfully made, and we consider that there is altogether insufficient direct evidence to warrant the assertion that the autumnal swarms of *Anosia Archippus* migrate from the more northern parts of its summer range in America, to the south, in order to winter there. Some of the quotations which we have just reviewed, and others mentioned by Riley, show distinctly that he swarms do sometimes fly more or less from north to south, or from north-east t

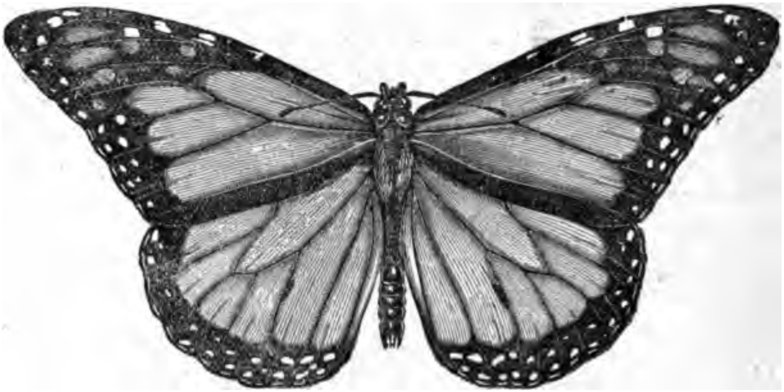

Fig 7.

south-west; but the general opinion that one is compelled to form, after reading most of the notes relating to the autumnal swarming of this species is, that the large congregations of butterflies that then collect will, given fine calm weather, stay long (in swarms) in one place, and the evidence is altogether insufficient to show that these go south-west rather than in all (or any) directions apart from weather conditions."

When one's opinions are distinctly challenged, one naturally feels a desire to vindicate them; and as there is much in these quotations that is in direct opposition to my belief on the subject, which has been largely formed upon actual observation, influenced no doubt by what I have read, I shall review them somewhat in detail, in an attempt to make it clear that I, and many others on this continent, have not wholly misunderstood what we have seen. Mr. Tutt seems to be needlessly skeptical on some points, in view of what he informs us of the wonderful performances of this butterfly, which he appears to accept; and I doubt not that a little personal observation would convince him of it.

I know nothing of the habits of Pyrameis cardui in Europe except what I have read; but in this country, my attention was soon attracted by its periodicity when I began collecting. I have seen in some seasons, cloverfields just alive with fine, large, rosy specimens; whilst in others I have watched carefully for them all summer and not seen one. I have seen its larva in such numbers as to consume all the thistles in one field, and cross the road in masses to another for fresh food, whilst the whole neighbourhood became alarmed that their crops were to be destroyed by an invasion of the army worm. I came to the conclusion that they appeared every third year; and sometimes then only in very moderate numbers, yet I never observed anything in any of its peculiar habits, to in any way correspond with those of Anosia Archippus. It is rather unsafe to draw, confidently, conclusions from analogy when dealing with insects.

In the quotations made by Mr. Tutt from the few recorded observations made by different individuals, of the movements of Anosia Archippus; their gathering together in swarms preparatory to their migrating, and their passing over the country in flocks, have got somewhat mixed, some of them referring to the one, and some to the other. All admit their assembling; the purpose of their assembling has to be inferred, which gives plenty of scope for the play of the imagination. The butterflies take weeks in collecting before they depart. Having chosen their rendezvous, they have to come together from a considerable extent of territory around, to accumulate the multitudes they often do, and that takes time. How those at a distance get to know of the spot is a very interesting and puzzling thought, but that they do in some way is a fact. Now, it is during this gathering process that the coming in the evenings and the going in the mornings has mostly been observed, and is usually kept up for a length of time, regardless of the weather. No one observing these movements could help wondering and enquiring what the object of such conduct could mean; and if informed about their migratory habits, and watching them to the end, he would be satisfied that it was in some way intimately and directly associated with their intention to leave, and was preparatory to that very purpose. We cannot tell how their minds act in connection with the subject; we can only express our convictions in accordance with the operations of our own, drawn from observation. As the time approaches for their departure, which for this locality is about the first of September, the great majority that compose the swarm, gets into that singular dormant and listless mood, which is another very perplexing state of mind to account for, but which no doubt is also intimately associated with their future intentions; they will remain for days in what appears to be a state of semi-hybernation, when they show no great desire even for food. I have only once had the pleasure of watching one of these swarms assembling, but from all accounts it was quite characteristic of their doings at such a time. Some of my published observations will allow of expanding and commenting upon.

The woods where I saw the assembling of *A. Archippus* as recorded in Can. Ent. Vol. 12, p. 37, was that in which the asylum buildings at Hamilton now stand. My visits to it were made every other day. I saw the butterflies there three times, which would cover five days, and to the last they were perceptibly on the increase. I would get there about half past one, when I would find them hanging in clusters, quite motionless except when disturbed. That they should be there at that time of day, in that condition, caused to wonder greatly. Whether they had been out in the morning or not I cannot say;

but when I would be leaving about half past five, individuals were still arriving, and some of them had to descend quite a distance to the tops of the trees as if they had traveled from afar, and not at all like ones that had been feeding in the vicinity. During these observations the weather was fine, what it may have been when they left I do not know as I did not see them go, which must have occurred within three days after my previous visit. The swarm that I saw just starting out on its journey, Can. Ent. Vol. 20, p. 138, was in a locality about thirty miles east of Hamilton. I was there upon a visit, and had gone out to a field, with many bushes about stumps and fence corners, to look for moths and beetles. Whilst engaged in my search, my attention was diverted by the numbers of *Archippus* that were floating around me. When I looked up I at once realized what was going on. My eye traced the stream to a wood from whence it was issuing, which was on the far side of the field, and thither I made my way. As soon as I entered the wood I was struck with the contrast which the attitude of these presented to those of my former observation. There, quiescence; here, animation. Everywhere I looked there was movement; but not of the wings. The whole swarm was evidently controlled by one impulse; and in presence of it I could not resist the conviction that it was associated with their going. Were they just arousing themselves from a previous state of lethargy? The seemingly few that were on the wing and making for the open were coming from the far side of the wood, which was out of my sight, as well as of those that were near the front, and were closely following those that had already started. And this gives us a clear idea of how these long drawn out flocks that are so often seen passing over different parts of the country are produced, and I have always considered myself as particularly fortunate in seeing this illustration of how it is done. Although those high in the air were keeping to a comparatively direct course, there were hundreds of them in sight that were swooping and swirling around the bushes in the field; yet they never allowed a gap to form in the procession. The weather at the time was fine; no storms in view, past, present or prospective, to influence their movements.

That swarms will encounter storms, both while forming and upon their travels is certain, and that their movements will be to some extent modified by them is also certain. But my conviction is, that they will invariably choose fine weather for starting on their pilgrimage. Here is what Mr. J. A. Allen has to say of their movements in Iowa. Trans. Chic. Acad. Sc., i. 331. "This extremely abundant butterfly seems to prefer the open prairie, but is driven to the groves by the winds which sweep furiously over the prairies in the summer months, and especially in September; here the butterflies are collected in such vast numbers on the lee sides of trees, and particularly on the lower branches, as almost to hide the foliage, and give to the trees their own peculiar colour. This was seen not in one grove alone, but in all of those that were visited about the middle of September. If unmolested, they remained quietly on the trees; if disturbed by blows upon the trunk or branches of the tree they would rise like a flock of birds, but immediately settle again, either on a contiguous tree or upon higher branches of the same. At New Jefferson, a little later in the year, when the gales had abated, they were seen leaving the groves in vast flocks, and scattering through the air almost beyond reach of the eye." There we have a picture presented of collecting swarms. But I suspect that Mr. Allen has slightly mistaken the purpose of their collecting, which was not so much to obtain shelter from the furious winds, as to prepare for their future journey, as disclosed by their leaving later on. My impression is, they rather enjoy a stiff breeze, and understand well how to manage themselves in it. But what interests us most in this connection, is, that they did not start out until the gales had abated.

That these autumnal swarms of *Anosia Archippus* leave the northern portion of the continent and go southerly, is, I think, the firm conviction of most, if not of every entomologist in North America. Which is not surprising when we know that they have never been seen going in any other direction in the northern portion of it. That but few observations have been recorded by competent persons, compared with the importance of the subject, is acknowledged by all. That there are so few interested and competent individuals on the routes these swarms travel, to make observations, compared with the extent of territory over which they have to pass, is confessed and lamented by many; yet the few observations that have been made, defective as they are, when dates and localities are tabulated, exhibit a progressive movement in that direction, which sustains and confirms the general opinion on the subject. Take these which are referred to by Mr. Tutt:

Saunders, Port Stanley, September 1st.
Scudder, New Hampshire, do 2nd.
Peabody, Wisconsin, do first week in.
Dr. Hamilton, New Jersey, do do do
Mundt, Illinois, do 7th.
Anonymous, Ohio and Indiana, September 19th and 20th.
Dr. Ellzey, Maryland, do 23rd and 25th.
Dr. Neal, Texas, October 4th and 6th.

Dr. Thaxter, Florida, being without date, may be placed anywhere between 1st November and last of February; whilst he is reported in another place as having said, "that he had found *Archippus* wintering along the Gulf of Mexico in immense numbers." Which taken in connection with the fact that there is not enough of their foodplant there, to produce a tithe of them, is strong presumptive evidence that those there seen had come from the north, where we know they are bred in countless numbers. That many of the travellers will perish by the way is what is to be expected, but that the bulk of one of these swarms could not complete the journey from their northern limit to the Atlantic coast, is not to be thought of in connection with a butterfly that has succeeded in reaching a land 2000 miles across the ocean from the American continent.

In reference to Mr. Bowles's observation, Can. Ent vol. 12, p. 134, which was a valuable addition to our information of its habits at that time, but proves nothing, except that the butterfly is a wanderer and liable to be overtaken by a storm and perish, whilst in the act of crossing our great lakes; I have seen specimens of it that were thrown up with the drift on the north shore of Lake Erie. I have seen the west shore of Long Point strewed for miles with their wrecks after a storm. And I have picked up some of them, apparently dead, placed them in the sunshine and seen them revive and fly away. These were bright fresh specimens of that season's production. But that any of them had fallen into the lake from exhaustion by long continued flight, I would say for that butterfly; never! Its mode of flight is so easy and graceful, that it looks as if it could remain on the wing indefinitely without tiring; it indicates amusement rather than labour. It never appears to be in a hurry; unless it has got a fright, and then, racehorse speed is slightly suggestive. During oviposition, the female gives one the impression of her being intent on business; and moving from place to place with great speed; but her progress is made in long sweeping curves, with scarcely a flutter of the wings, which does not suggest exertion. It has a dexterous way of using a strong breeze to help it along. I have seen one go up the side of a two-storey house and over the roof without a flap of its wings. All it required to do, was to set itself at the proper angle and the wind did the rest. Even when they have started out upon their long journey southward, those near the ground do not reserve their strength by refraining from amusement. With many a sweep and swirl they are up and down, here and there and all around, yet never allowing themselves to fall behind the steadily advancing stream. Mr. Alexander of Her Majesty's Customs Department, Hamilton, informed me that on one occasion he was crossing Lake Erie from the American side, and that they sailed for hours through a flock of *Archippus* going in the opposite direction; and when the steamer reached Port Dover the butterflies were still going out over the lake. And from his description of their behaviour on the water, it corresponded exactly with what I have so often seen upon land; some high in the air, others skimming over the surface of the lake, or dotting the space between, whilst many found time to come on board, and investigate the mysteries of the deck.

As to its "continuous-brooded habit," I have never seen the slightest indication of such a thing in Ontario. From the time that freshly emerged specimens appear in July, to the time they depart in autumn, they never show the least regard for each other sexually. So marked is this feature of their conduct during that time, that it was asserted by some, that those great gatherings of them were composed entirely of one sex, but this was soon proved to be not the case: yet it brings to view how much that peculiarity attracted attention. Dr. Scudder claims "that no Anosia Archippus born northward ever lays eggs the same season;" and I am quite prepared to believe it. On one occasion I obtained a chrysalis of that butterfly in the latter part of October, which matured by the

6th of November. Was this an attempt at producing a second brood? Reasoning from analogy one would unhesitatingly say, yes. But from all my observations of that butterfly, I as unhesitatingly say, no It was but a retarded specimen from a more southerly born parent; and would probably not have matured in nature at all. It is no unusual thing to find dead chrysalids after frost that give no indication of being parasitised. Although Dr. Thaxter saw some of them in Florida making an attempt at producing a brood there, yet the fact that they were still in swarms, clearly indicated that their time for breeding had not yet come, or they would have been dispersed. Now then, seeing that fresh hatched specimens begin to appear here about the middle of July, and continue on the wing in increasing numbers to the beginning of September, when a great proportion of them takes their departure; and that portions of these same swarms may reach the latitude of Maryland about the end of September, Texas and Florida in October and November, that they winter along the Gulf of Mexico, or even further south, and that it will be the end of February or the beginning of March before their regular time of breeding begins, and that we have not the slightest reason to believe that they hybernate at all, anywhere, as *Antiopa* and the *Graptas* do; there seems to be a reasonable excuse for the belief that *Anosia Archippus* is a long lived butterfly, and that continuous-lived would be quite as appropriate for it, as continuous-brooded.

That any *Anosia Archippus* leaving Ontario in the autumn, will return to it in the spring to propagate its species, is a matter upon which we have no information whatever; and seems quite improbable. But that the first ones that appear here do come from the south of us, admits of no question. Yet the terms "north and south," are often used in such a loose and ill defined manner, as likely to cause confusion. Hence Mr. Tutt has tripped over my "doubtful logic," when speaking of their going south in the autumn, and returning in the spring; when it was the "species" that I meant, and not the individuals; which I ought to have made more clear.

There are but two statements that I can find, that provide any basis upon which to form a calculation as to the distance from which our first arrivals may have come. Edwards speaks from West Virginia, Riley, from Missouri. West Virginia is a long way south of Ontario; so we are not warranted in concluding that the behaviour of *Anosia Archippus* there will be identical with what it is here. Edwards in his life history of *Danais Archippus* (Psyche, Vol. ii, Dec. 1878, p. 169,) says: "In this part of West Virginia, *D. Archippus* is, I have reason to believe, four-brooded, and the butterflies of the last brood, and these alone, hibernate. The survivors appear very early in the next spring, and are always faded and more or less broken." And through that whole history, he makes his estimates upon the principle that it is a hibernating butterfly. Now the fact that Dr. Thaxter found it wintering along the Gulf of Mexico, utterly precludes the idea of its hibernating in any true sense of the word. So Mr. Edwards's "survivors" came from a good way south of West Virginia. Riley also speaks of it in the same way; which was quite excusable at that time, as facts to the contrary had not been disclosed, and they reasoned from analogy, and so the habit has been kept ever since; but we must now view it another light. Edwards's spring dates are, butterflies appear the last of March. Eggs laid the second of May, butterflies from these, thirtieth of May. Riley, 3rd annual Missouri report, p. 144, says: "They commence depositing eggs in the latitude of St. Louis during the fore part of May . . . Butterflies from these eggs begin to appear about the middle of June." These are the only observations made in the south, giving dates, that I find to estimate time and distance by. Now *Anosia Archippus* makes its appearance in Ontario about the first of June and before, according to the season. Are our first arrivals specimens that were born in either of those localities, or there-about? Certainly not from the Missouri broods. But West Virginia is the most likely direction from which our first visitors would come; and here again we see, that there is not sufficient time for the first Virginia bred specimens to make the journey to Ontario. Then whence do they come? Our only answer must be; from some broods born much further south than West Virginia.

As to "swarms going in the opposite direction," we have no spring swarms in the north. And those observed and recorded in the south, do not seem to seriously conflict with observations made in the north. The "bevy" that was seen in Texas the last day of March, containing thirty individuals, would not be considered in the north of sufficient importance to notice which way they were going. The report received by Riley fro

Mr. Wells of Kansas, of a swarm which he saw in the middle of April, "that came rapidly with a strong wind from the north-west," seems to be of somewhat uncertain interpretation. But there is one thing I feel quite certain of, let Anosia Archippus, wherever, or in which ever direction it might be going, get caught in a gale it would head against it. I have seen individuals of them out in a gale that I could hardly hold against; low down, slowly but steadily making their way in the opposite direction, and that with little apparent flutter of the wings but with them closely reefed, until tired of the monotony of the procedure, or not wishing to go any further in that direction, they would suddenly shoot up and get hurled fifty or more feet in the direction they had come, then turn and go through the same performance over again. They may do the same in flocks, who can tell?

If I were undertaking to draw up a programme of the proceedings of this butterfly from my abundant lack of information; and filling in what I don't know with what I think is most likely, it would be something like this: *Anosia Archippus* is a southern butterfly, which has inherited a powerful migratory instinct, and is endowed with a capacity to indulge it to the utmost limit of its inclination. The northern portion of the American Continent, is where it finds the conditions most favourable for the multiplying of its species to an unlimited extent. But it cannot endure frost, therefore goes southerly in autumn, and with that purpose in view gathers into immense swarms before it starts out. It makes the journey in easy stages, spending months on the way. As it does not hibernate, it keeps on the move south-west until its breeding season comes round, when these, or more southerly bred specimens, start the northerly movement. Reference has been made to the habit of birds; an excellent comparison for my purpose. We know that they leave their southern residence for the north at a suitable period of the year, and by the time the species has reached its northern limit, the whole continent is uniformly stocked. No part missed, no part burdened with an over supply, and we know that the southern ones will be breeding before the northern ones have commenced building. Apply the same principle to our butterfly; only she has no building to do, and no care to take of her young, so she is not required to settle down in one locality, but may place one egg here and another there as she finds it convenient and pass on. Now I will accept and be guided by Mr. Edwards's observations in West Virginia, as to her conduct there, but not his conclusions. He says, (Psyche as previously quoted,) "The survivors (from hibernation) appear very early in the next spring, and are always faded and more or less broken (From much exposure and long travel as I believe) They may be seen * * * the last of March; * * the females deposit their eggs the last of April and early in May on the leaves of different species of Asclepias, beginning as soon as the plants are well out of the ground, and thereafter, without doubt, soon die, after the manner of their kind" In that we learn, that our southern born butterfly was not in a condition when she reached West Virginia to oviposit. That it took a month to mature her eggs. How many of those who started out with her, spent that month in going further north, and so have reached Ontario about their usual time? A few butterflies will stock a locality with a species, if eggs are all laid together at one time; which I think is not the case with this one, hence the absence of well defined broods. And Mr. Edwards proved that they do not "soon die" after finishing egg laying by capturing one on the 2nd of June, with her ovaries quite empty. So here we have still an interesting question to settle, how long do they live before finishing. when they survive for sometime after? Again Mr. Edwards says, "every female from which I have obtained eggs in confinement, later than May, and all those which I have noticed as they were ovipositing in natural state, have been fresh colored, and evidently not long from chrysalis; (I have witnessed similar phenomena in Ontario during the first part of July.) So I have no idea that this species differs in this respect from other butterflies. One brood of *D Archippus* succeeds another the season through, the females of each brood depositing their eggs within two or three weeks after emerging from chrysalis, and soon after dying; and the last brood of the year hibernates, the females not to be impregnated till the next spring" Which would be all correct, if we were dealing with a species that goes the round of its life's history in one locality, hibernating there in winter, and producing its kind in summer, year after year as so many do. But analogy fails us here; for we have to do with a species that requires the continent for a home, ranging from a defined northern limit on the one hand, to an undefined southern extension on the other, with no apparent attachment to a locality but what suits its present needs; seemingly conscious of its being but a transient resident anywhere; chased from the north by the approach of winter, it is compelled by a necessity of its nature to return to it in the spring. Leaving the north in united multitudes in the autumn, it returns to it by independent units in the spring; and believing that there are several broods of it in the south, and that each of them is controlled by the same strong desire to travel, which at that season means northward; and that these will follow the same route as did the previous ones, depositing eggs where some had been laid before; I get an explanation for the comparative freshness of the butterflies that are late in arriving at the north, and in the great disparity in the size of caterpillars found on the milk-weeds during the season. But where to draw the line between north and south for them, I will not undertake.

PARASITES IN THE EGGS OF CHRYSOPA.

By J. Alston Moffat, London.

On the 19th of June, 1900, whilst strolling in Victoria Park, London, my attention was arrested by an unusual looking object on the underside of a linden leaf, attached to a projecting branch a little above the level of my eyes. I plucked the leaf to closely examine it, but could not decide as to whether it was an animal or vegetable production. Afterwards remembering that I had seen an illustration somewhat resembling it, I turned it up, and found that singular object to be an egg cluster of the delicate lace-winged fly of the genus *Chrysopa*.

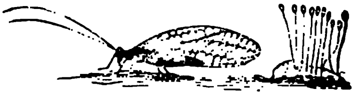

Fig. 8.

The Rev. J. G Wood, in Insects at Home, page 281, thus discoursed upon the eggs of this insect: "They are generally deposited upon leaves, but, instead of being laid directly on the leaf, every egg is fixed to the end of a slender footstalk about half an inch in length. This footstalk is formed from a viscous matter secreted by the female, and is delicately white and translucent. Mr A. G. Butler, of the British Museum, told me that he has kept lace winged-flies, and often seen them lay their eggs. The end of the abdomen is first pressed against the leaf, and a tiny drop of the viscous matter deposited. The abdomen is then raised quickly so as to draw out a thread, which becomes stiff and hard almost as soon as it comes into contact with the air. Then the insect pauses a little, and rapidly places an egg on the end of the thread, fixing it there with another drop of the secretion. The eggs are always laid in groups. . . . They bear a curious resemblance to the capsules of certain mosses, and indeed have been described and figured in books as specimens of British moss". Which is not very surprising, as they instantly suggested a moss in fruit, but much more slender than any moss that I had seen.

There were thirty-four eggs in the cluster, and a single one placed on the upper side of the leaf. The eggs were about the thirtieth of an inch in length, and about as long again as they were wide. The stalks would bend to every breath, like a field of heavy laden grain before a breeze; giving the impression that they were top-heavy. I placed the leaf in a box and awaited developments. In a day or so the eggs changed colour, becoming darker, and I fancied larger. One morning on taking my accustomed view, some of the eggs had become white, and upon applying a lens I found they were empty, nothing but an extremely thin shell left with a hole in the top, out of which an insect had come. I then made diligent search to find them, when I at last discovered three tiny creatures in a depression of the leaf near the mid rib, as if they had therein sought safety and shelter. They were about three times as long as they were wide, and each armed with a pair of tremendous jaws which appeared to form quite one half their entire length; reminding me of the ant lion, to whom it is said to be related. That was my only view of them, for the next time I looked they had all disappeared. Having no Aphides to feed upon, probably the stronger devoured the weaker and then escaped from the box. Six of the eggs had matured and given forth their contents, whilst in the meantime the others had assumed a leaden hue. On the 28th of the month I was looking at them to see if there were symptoms of change, and wondering what might be the cause of their present appearance, I observed a dark speck moving rapidly on the white paper with which the box was lined, and on examing with a lens I discovered it was a fly. It was honey-yellow in colour; its head was wide and squarish, with thorax of similar width, and abdomen tapering suddenly to a point. Its eyes were situated on the outer corners of its head, like those of a *Cicada*, dark colored and prominent. Its wings lay flat on its back, and projected half their length beyond the abdomen. It was very active, running rapidly and disappearing by flight every now and again, to reappear in another part of the box. I now turned my attention to the discolored eggs, and found several of them had holes in their sides out of which Ichneumons had escaped; and probably that fly was one of them. Upon making a closer examination all the discolored eggs had on their surface, what were in all probability Ichneumon eggs, and upon one of them I counted six. Clean-cut round holes out of which Ichneumons had escaped were found, variously located on some of the Chrysopa eggs, but in no instance had there more than one parasite matured in any one egg, and the great majority of them had not given forth any. There was abundant evidence to prove it a clear case of overdone parasitism, and that the most of the parasites had failed to mature from lack of sustenance. Many of the *Chrysopa* eggs exhibited several circular markings on their shells, as if they had been made on the inside preparatory for the escape of the fly, which had died before accomplishing it; whilst others shrunk and cracked upon drying.

A manifestation of this sort seems like a great waste of energy in nature, and a lack of intelligence on the part of the creature committing it, which is hardly in accord with the theories promulgated by some writers about the forethought exercised by forms of life, for the progress and improvement of their kind. In this instance we see merely a female ichneumon, constrained by the controlling impulse of her nature to deposit her eggs. Having found a cluster that answered her purpose, she fulfilled her mission regardless of consequences: and whilst she overlooked some of the eggs, she deposited far too many upon others, which came very near exterminating a whole brood of this useful insect; whilst at the same time she nearly extinguished the life of her own offspring. Therein giving us a fine illustration of how the works of nature are carried on under an established government by law; when each individual is strictly following the controlling impulses of its own nature, and yet is not prevented from taking a departure from routine in case of an emergency.

THE DRAGON-FLIES OF THE PROVINCE OF QUEBEC.

By Rev. T. W. Fyles, D.C.L., F.L.S.

Among the most beautiful of the insect tribes are the dragon-flies. The imposing size of many of the species, the brilliant colouring of their eyes and bodies, their wide-spreading, closely-reticulated wings, the rapidity of their flight, the dash and *élan* of their approach, the rustle of their wings as they sweep around, fill the intruder upon their haunts with admiration.

This admiration is increased when an opportunity is afforded for a close examination of one of these remarkable objects. The head of the insect seems to be made up mainly of eyes and mouth. The innumerable facets of the protruding, compound eyes glow with prismatic hues. In Æschnidæ and Libellulidæ these eyes are contiguous, and there is but a very small space between them and the mouth organs; but in this small space there are three ocelli or single eyes. The dragon-fly can see above and below, behind and before. It detects every motion of its enemy or its prey, and its powers of flight enable it to escape from an assailant and overtake a fugitive.

The mouth of the dragon-fly is furnished with two large flat lips, which work up and down, and enclose the mandibles and maxillæ like a visor. When the creature is feeding this motion of the lips would lead one to think that the jaws move vertically, instead of horizontally, as is really the case.

Besides its powers of sight and its formidable mouth-organs, the dragon-fly has an advantage which many other insects have not—its head moves freely on its neck. It can turn its head half way round. Woe to the unhappy insect that comes in the way of so formidable a spoiler!

The thorax of the dragon-fly is capacious and somewhat barrel-shaped. It contains the powerful muscles necessary to move and control the four ample wings and the six legs of the creature.

The abdomen extends far behind, to steady the insect, and to aid in steering its flight; but in the Libellulidæ it is somewhat flattened and ends with a point. In *Corduligaster* the cylindrical abdomen ends with a knob or swelling, hence the name, a club, a paunch. In *Gomphus* the abdomen is spatulate at the end.

July and August are the months in which the dragon-flies abound. Then every pool, every stream, is frequented by them. Sometimes the observer may see them in the act of depositing their eggs. They alight upon the flags, arrowheads and other aquatic plants, and taking suitable positions dip their abdomens into the water, and deposit their eggs in masses upon the stalks and leaves beneath the surface.

The embryos, in different stages of their growth, have been observed and figured, and the larvæ of various kinds are known. To the possessor of an aquarium the study of the habits of the dragon-fly, in its early stages, would afford great pleasure.

A dragon-fly larva is a wonderful thing. At first sight the uninstructed observer does not see much to admire in it, but closer examination reveals features of exceeding interest. One of these is the extraordinary under lip of the creature, which takes the form of a jointed arm, furnished at the extremity with nippers for securing its prey. When not in use this instrument is neatly folded under the throat of the larva—it is called "the mask" (Fig 9). Then too, the peculiar arrangements by which the insect obtains oxygen, its vital breath, from the water, are worthy of notice. It has no head gills, as the fish has; no branchiæ like the larva of the Horned Corydalis; no breathing tube like that of the rat-tailed maggot of Eristalis. The respiratory organs lie within the abdomen, and the water is admitted to them through an orifice furnished with five angulated plates, which open or close as need requires. Ordinarily the process of the alternate admission and expulsion of the water goes on with easy regularity; but when the creature is alarmed or stimulated by the sight of its prey, the water within its body is expelled with sudden force, and the tiny current, impinging upon the inert volume around, sends the insect forward with a rush, as the rocket is sent through the air by the pressure of the gases suddenly generated by the combustion of the materials with which the case is filled.

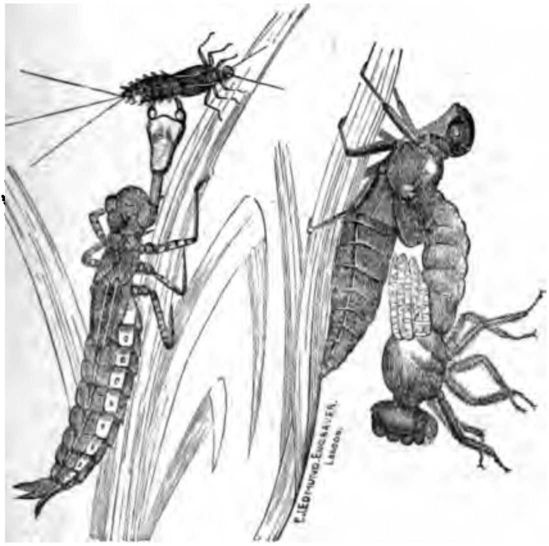

Fig. 9.—The left figure represents the larva with its protruded lip in the act of seizing its prey; the right shows the perfect insect emerging from its pupal case.

The metamorphoses of the dragon-fly are incomplete. At the pupal change the insect does not become quiescent, nor does it cease to feed—it retains its active habits and voracious appetite. When the time comes for it to assume the imago state, it climbs some plant or other object till it is clear above the surface, and then its skin bursts along the thorax and the perfect insect crawls out of the opening and leaves its old habit, attached by the claws, as a memorial of its former state. (See Fig. 9.)

Having thus introduced the Odonata, and given some glimpses of their habits, we will now notice their classification.

They are divided into four families: AGRIONIDÆ, GOMPHIDÆ, ÆSCHNIDÆ, and LIBELLULIDÆ. These are easily distinguished each from the others.

The Agrionidæ have the eyes wide apart and placed apparently on pedicels.

The Gomphidæ have large eyes, near together, *but not touching each other.*

The Æschnidæ and Libellulidæ have eyes that are contiguous. In the former *the labial palpi have three joints*; in the latter the joints of the labial palpi *number*

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Maculata, Beauv.
Lestes, Leach.
Unguiculata, Hagen.
Agrion, Fab.
Hageni, Walsh.
Ramburii, Selys.
Iners, Hagen.
Positum, Hagen.
Saucium, Burm.
Civile, Hagen.
Durum, Hagen.

GOMPHIDES.
Gomphus, Leach.
Vastus, Walsh.
Fluvialis, Walsh.
Fraternus, Say.
Exilis, Selys.
Spinosus, Selys.
Rupensulensis, Walsh.
Colubrinus, Selys.
Corduligaster, Leach.
Lateralis, Scudder.
Obliquus, Say.
Petalura, Leach.
Thoreyi, Hagen.
ÆSCHNIDES.
Anax, Leach.
Junius, Drury.
Æschna, Fab.
Constricta, Say.
Vinosa, Say.
Verticalis, Hagen
Heros, Fabr.
Janata, Say.
Septentrionalis, Ramb.
LIBELLULIDES.
Macromia, Ramb.
Transversa, Say.
Illinoisensis, Walsh.
Epitheca, Charp.
Yamaskanensis, Prov.
Forcipata, Scudder.
Princeps, Hagen.
Elongata, Scudder.
Albicincta, Burm.
Linearis, Hagen.
Cordulia, Leach.
Uhleri, Selys.
Lateralis, Burm.
Plathemis, Hagen.
Trimaculata, De Geer.
Subornata, Hagen.
Libellula, Linneus.
Quadrimacula, Linn.
Pulchella, Drury.
Exusta, Say.
Diplax, Charp.
Rubicundula, Say.
Scotica, Donovan.
Hudsonica, Selys.
Intacta, Hagen.

Many of these species are reported to have been taken on the Yamaska River.

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First then, the beautiful "Demoiselles" (as the French call them) will be readily brought to mind. They may be found, in their season, on the banks of all our streams, and they are particularly abundant along the brook that crosses the road at St. David. These insects of the genus Calopteryx have wide-spreading equal wings, and long, slender, stainy and deep green bodies.

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One of our most common dragon-flies is *Gomphus vastus*. It may be known by its black and yellow livery, and by the remarkable widening out of the three abdominal segments immediately before the last. This species abounds in the woods around Fort No. 2, Levis. I have no doubt that its larvæ may be found in "Mer-de-Papon" and other pools in that neighbourhood.

The Æschnidæ are large and handsome insects. The rarest of them in these parts is *Anax junius*. I saw a pair of these sporting over a sheet of water near Spruce cliff last season, but they were careful never to come within reach. Æschna septentrionalis is often met with. It is that large black and bright blue dragon-fly with hyaline wings of a faintly green cast—the stigmata being long and brown. I always look upon this as the typical dragon-fly, "the Devil's darning-needle, the "Horse-stinger" so dreaded by children. I need not say that it is quite incapable of injuring either horse or man.

The species of the genus Libellula are all handsome insects. Their abdomens are dagger shaped, ridged down the middle, sloping to an edge on either side and pointed at the extremity. The female of *Trimaculata* has three brown patches on each of its wings—one patch at the base, one in the centre, and one at the tip. The spaces between are clear. The male (Fig. 10) has a patch at the base of each wing, but the tip of each is clear, and there is a large brown patch in the centre extending from the costa to the inner margin. The abdomen of the male is of a bluish white, as if it had been painted. A much larger and more beautiful insect is *Pulchella*. This also has three patches on each wing, but of a richer brown than in the last instance, and the spaces between the patches are clear white. *Quadrimaculata* is another very beautiful insect in this genus. It may be known by the golden yellow streak, and the two rich brown spots on each wing, and the angulated patch at the base of the secondaries. The abdomen of this handsome insect is brown, and has a row of yellow spots on either side. Quadrimaculata is found in Europe as well as in America. It was named by Linneus. It is very plentiful at the "Gomin." It breeds, no doubt, in the pools that lie to the south of the swamp.

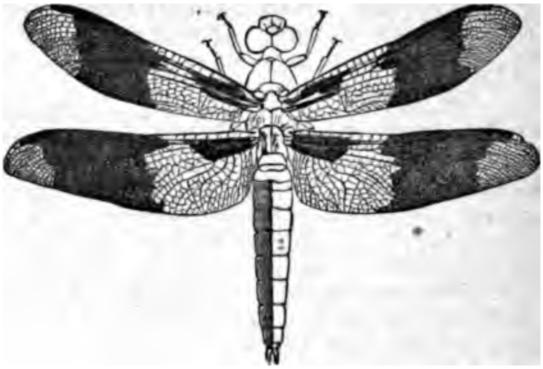
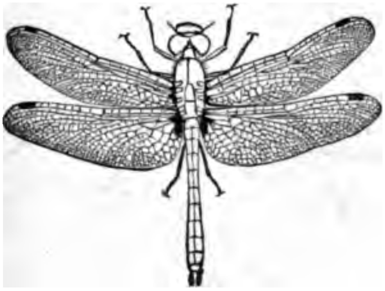


Fig. 10.

Of the genus Diplax, *rubicundula* seems the most common of our species. It abounds on the Chaudiere River. Insects of this genus may be readily known by their smaller size, their awl-shaped abdomens, and the very distinct stigmata of their hyaline wings. (Fig. 11 is the male of Diplax Berenice; Fig. 12 the female; Fig. 13 Diplax Elisa).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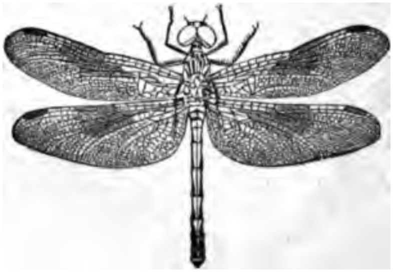
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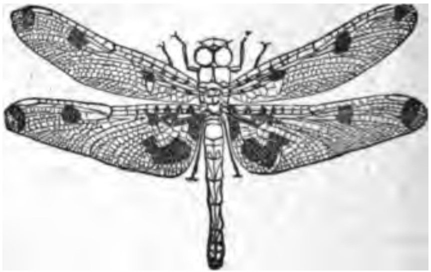
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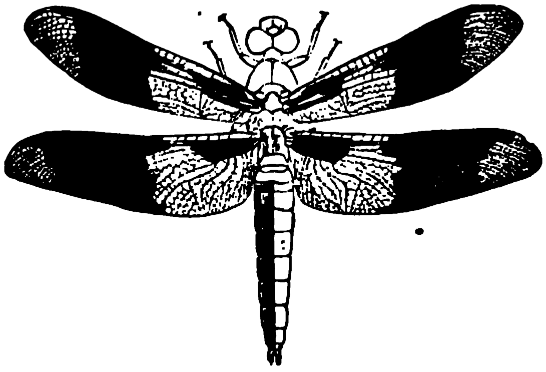

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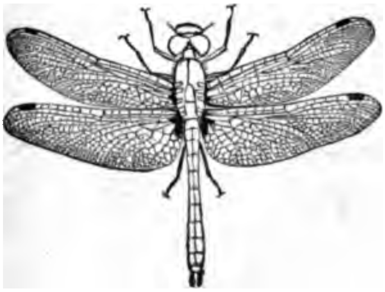

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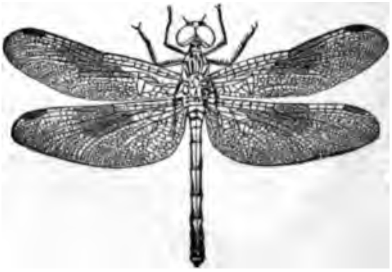

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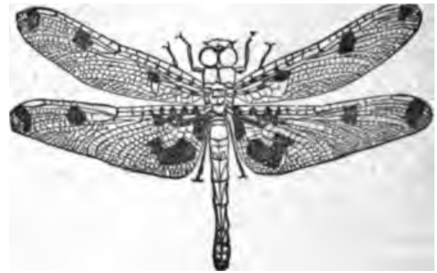

Fig. 13.

THURSDAY, NOVEMBER 15TH, 1900.

The Entomological Society resumed its sessions at 11 a.m, the President, Rev. Dr. Fyles, in the chair. After the reading of a paper by Mr. Henry H. Lyman, of Montreal, on "Specimens of Spilosoma Congrua, Walker, and kindred species in the British Museum," the meeting proceeded to the election of officers for the ensuing year, which resulted as on page two.

A number of papers were then read, followed by brief discussions in each case. After an intermission for lunch the meeting continued till five o'clock p.m., when the members from a distance left to catch their respective trains. Votes of thanks were adopted to Dr. Fletcher, Mr. H. Hague Harrington, and Mr. C. H. Young, of Ottawa, for their kind donations of rare specimens to the society's collection. Letters of apology for non-attendance were received from Dr. Wm. Saunders and Mr. Harrington, Ottawa; Mr. J. D. Evans, Trenton, and Mr. D. G. Cox, Toronto.

A large case of rare Lepidoptera was exhibited by Dr. Fletcher, special mention being made of many of the specimens. These had all been taken in Canada. mostly during the past year, and those of which special mention was made are the following:

Papilio Brucei. A specimen of this rare butterfly was taken at Regina by Mr. T. N. Willing, and along side of it was shown a bred specimen which Dr. Fletcher received from Mr. W H. Edwards This Dr. Fletcher believed to be the first record of this insect having been taken in Canada, although it is mentioned in a list received from Mr. J. W. Cockle, of insects he has taken at Kaslo in the Kootenay mountains.

Vanessa Californica. Some beautiful bred specimens were exhibited, pupæ of which had been sent from Kaslo by Mr. Cockle. This is a seasonal insect which is usually rare but occasionally very abundant.

Attacus Ceanothi. A specimen of the moth bred from cocoons received from Mr. E. W. Haines, who formerly took a female at New Westminster, B.C. and has since bred two broods of the species in confinement in England. A fine series of inflated larvae showing every stage was also exhibited.

Memythrus (Sciapteron) *tricinctus* bred from cotton-wood twigs sent from Cottonwood, N W.T.

A fine series of Arctians, including a beautiful series of *Arctia phalerata* with inflated larvae in all stages, which were described in full in a paper by Mr. Arthur Gibson, *A. Caja*, var *Americana*, *parthenos*, *Parthenice*, *Yarrowi*, from Hudson Bay, *determinata*, *vittata*, *Anna*, *figurata*, *Williamsi*, *Blakei*, etc, were shown.

Colias Eurytheme. Some interesting specimens of this species showing all the recognized forms and all collected at Ottawa, were shown. This has been one of the characteristic insects of the year and has been unusually abundant throughout Ontario.

Terias Lisa A nice female taken at Ottawa by Mr. Gibson on the 18th Oct

Pseudolimacodes littera. A fine specimen of this pretty little moth, also taken at Ottawa by Mr. Gibson was shown.

Thecla Damon. A specimen taken at Picton on the 24th May last, by Dr. Fletcher.

Pieris rapae. An interesting series showing many variations was exhibited, including the buff female, and the very rare yellow female, the variety *novangliae*. The males of this variety are not uncommon, but the female is extremely rare. Dr. Scudder mentions that Curtis took a yellow female in England many years ago, and there are doubtless others but they are not recorded. Taken at Ottawa by Mr. Gibson, 18th Sept.

Peridroma saucia and *Noctua C nigrum.* These were the two devastating cutworms of the year. The former throughout the Province of British Columbia and the latter in Central Ontario. Beautifully inflated larvae in the last two or three stages were exhibited, with the moths

Pamphila Zabulon and *P. Hobomok* were shown in both sexes and the differences pointed out. It was claimed that these were distinct species and that *Hobomok* was probably the only one that occurred in Canada. The members were asked to be on the lookout for specimens of *Hobomok* which had not the veins darkened where they crossed the yellow colour of the disc. If they found one it would probably be the true ***Zabulon.*** ***Zabulon*** has no yellow female, but *Hobomok* has both a yellow female and a black female variety, which is called *Pocohontas.*

Euptoieta claudia bred from violets from Kinistino, N.W.T. Butterfly, larva, and pupa.

Pyrameis carye, butterfly pupa and larva. The larvae of this species were found by Mr T. N. Willing feeding on Nettle at Regina.

Cacœcia parallela. Larva, pupa and moths. A troublesome pest in a greenhouse at Hamilton.

Anacampsis lupinella. A new species of tineid bred from lupin collected at Toronto. Larva, pupa and moths.

The following specimens of insects were kindly presented to the Society by Dr. Fletcher:

Vanessa Californica,
Plusia rectangulum,
Plusia mortuorum,
Xylina contenta,
Lithomia germana,
Arctia phalerata,
Culex pungens,
Culex stimulans,
Anopheles quadrimaculatus,
Anopheles punctipennis,
Anthophilax malachiticus,
Arctia Williamsi.

A beautiful collection of inflated larvae was exhibited by Mr. Gibson. These had been collected during the past summer and showed several of the species in all their moults.

A fine case of rare moths taken at Ottawa was sent for exhibition by Mr. C. H. Young, of Ottawa, who kindly presented the Society with a beautiful pair of *Plusia aereoides.*

A box containing twelve species of rare *Proctotrypidae* not in the collection of the Society was presented by Mr. W. H. Harrington, of Ottawa.

THE SILKWORM INDUSTRY IN ONTARIO.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

The purpose of this article is to answer the question: Is a silkworm industry possible in Ontario? This question has been asked frequently during the past season, and invariably by persons residing in the county of Essex. The question is a very important one, for if the conditions be favourable for the establishment of such an industry considerable additional revenue would soon flow into the county, and enrich those engaged in the industry.

The various factors bearing on the successful establishment of a silkworm industry will be briefly considered.

During the past season Rev. W. M. Fleming, of Essex, reared a large number of silkworms from eggs, and had remarkable success in the production of silk cocoons. So gratified was he with his success that he naturally began to ask himself the question: Why cannot a silkworm industry be established in this country? In letters to the Department of Agriculture he advocated the breeding of silkworms as an industry which might be carried on very profitably by persons in poor circumstances, who had no regular employment, where the women and children could attend to the feeding and care of the worms.

The writer had occasion recently to visit Essex, when he made a point of inquiring into the silkworm conditions of the locality. Several prominent persons of business persuaded by the success of Mr. Fleming were of the opinion that cocoons could be produced in paying quantities, and were anxious to try further experiments next season. Moreover, many persons, uninformed as to the market conditions, felt that the Government should start a series of experiments to determine the feasibility of the whole project, and give aid in the form of a bonus.

The conditions necessary for profitable production of raw silk are: 1. Cheap labor, and many laborers. The chief silk-producing countries are those bordering on the Mediterranean, and in the far East where labor is very cheap. Experience, moreover, has shown that many laborers are required to provide food for the silk worms during the last ten days, just prior to the spinning of the cocoons. 2. Suitable food-plants upon which the worms may live and grow. The mulberry leaves are the staple article of diet in Europe and Asia, but in the United States it has been shown that the leaves of osage orange form just as good a diet as the leaves of mulberry. 3. Suitable climatic conditions of temperature and moisture. Experience again has shown that the silkworms may grow well in many countries, and slight changes of temperature do not affect their well being to any appreciable extent, although of course they thrive best in warm, semi-tropical countries. 4. A ready market for the cocoons, or rather the reeled silk. Here again the cheaper labor of the Old World tells against the development of silk industry in this country, and to sell the reeled silk in France or Italy means such a great reduction in profits that our people could not compete.

On inquiry in Essex regarding the extent to which the county could fulfil the foregoing conditions, the writer learned that the labour was to be done chiefly by the women and children, and only during the last few days would extra help be required. Skilled help would be secured at this critical period, for many factors enter into operation during the last few days which are of vital importance in successful rearing. The worms are ravenous, and the amount of food consumed is simply marvellous. Fresh leaves must be secured and given regularly so that the worms may feed continously. When the food-plants are not close by, the task of feeding many thousands of worms becomes too heavy for women and children, and extra help must be obtained. Again, the worms must be carefully watched at the time of spinning the cocoons to prevent two worms forming one united cocoon, as is often the case where the worms are kept too crowded Then, again, the cocoons must be secured and the enclosed pupae killed within the cocoons. The best method of killing the pupae is to place the cocoons in an oven heated to about 194 degrees F. All this work involves care, and if the silk growers procure their own supplies of silkworm eggs for the following season some additional care is necessary. The moths are allowed to escape from the cocoons which they usually do about two weeks after the spinning of the cocoons.

Essex county is fortunate in having a mild climate, one in which the mulberry and osage orange trees grow quite readily. Both the Russian and the native species are common, and two or three years would suffice to grow mulberry trees of such a size as to feed the silkworms of a large industry. Osage orange trees, too, are very abundant, and miles of hedges can be seen by driving along the roads of central Essex.

Through the kindness of Director Stupart, of the Meteorological Office, Toronto, the writer is able to give a comparison of mean temperatures of Essex county and Central France, the great silk-producing region of France. The mean temperatures for the months of April, May, June, and July are given below :

	Claremont, France.	Moulins, France.	Windsor, Ontario.
April	51.1	50.0	45.7
May	56.1	56.8	58.0
June	62.2	63.1	67.7
July	66.6	67.6	68.5

During the last week of May and the whole of June the silkworms are feeding, and by the first week of July the cocoons have been spun. From the table presented above it will be seen that the temperature of Essex differs but a little from that of Central France during the critical period.

The practical experiments carried on by the United States Department of Agriculture from 1884 to 1891 show conclusively that a most excellent quality of silkworm cocoons could be raised over most of the United States; and Dr. Howard, U. S. Entomologist, states as his opinion that the silkworm could without doubt be grown successfully in lower Ontario; but the absence of a home market for the cocoons puts the industry for the present out of the region of possibility. There are no establishments in the United States for reeling silk from the cocoons. No person could be induced to start reeling establishments for the reason that "no silk-reeler could afford to pay a price for cocoons which would induce even the poorest of our citizens (or even non-producing members of the family) to undertake the more or less arduous labors of raising worms. It was found impossible to convert the cocoons into raw silk, namely, to reel them in this country in competition with the cheap labor in foreign silk-producing countries."

In 1890 it was shown that even with the introduction of improved automatic, electric silk-reels it was impossible to compete with Europe and Asia without the imposition of a customs duty of not less than $1 per pound on reeled silk imported into the United States.

A few facts regarding the weight of silk-moth eggs and cocoons may be interesting to persons who intend experimenting with silkworms. One ounce of eggs contains about 40,000 eggs (in France a family usually undertakes to rear this quantity). From these are obtained from 80 to 120 pounds of cocoons, which yield from 11 to 17 pounds of reeled silk. About 300 medium-sized cocoons weigh one pound, while the silk reeled from these weighs about one-eighth of a pound. In other words, 2,500 medium-sized cocoons will yield one pound of reeled silk.

The life-history of the silkworm (*Bombyx mori*) is very instructive and interesting. Each female moth lays nearly 500 eggs in a cluster soon after she emerges from the cocoon about the first or second week in July. The fertilized eggs are drab-colored, while the unfertilized ones are white or grey. The young worm on its first appearance is nearly black, covered with stiff hairs, and is about one-eighth of an inch in length. It becomes full grown in about twenty-eight days, during which time it has moulted four times, becoming lighter in color with every moult. When mature it is creamy white, has a prominent projection on the dorsal surface near the end of the abdomen, and is two or three inches long. The spinning of the cocoon occupies nearly three days. The threads of silk are viscid for a few days and consist of two fibres secreted by two glands which run along the sides of the body and open together on the under lip of the worm. This double thread is said to be about 4,000 yards in length.

The pupa moults once within the cocoon, the skin of the first moult usually remaining attached to the inner surface of the cocoon. The color of the cocoon may be white, or yellow, or orange, and investigations fail to reveal the cause of the variation in color. In four or five days after the cocoon is made the silk is ripe, when the pupa may be killed by heating the cocoon to a temperature of 194 degrees F. in an oven as already mentioned. If the moth is allowed to escape one end of the cocoon is broken, thereby injuring the continuity and excellence of the silk threads.

The moth is whitish or cream-colored; its fore-wings are falcate, with one or two brownish lines crossing the wing. The moths are not inclined to fly much, and are easily kept in confinement until the eggs are laid. There is but one brood a year, but the greater part of the year is spent in the egg state. The active period covers little more than six weeks, of which four weeks are spent as worms.

Concluding, the present market condition for reeled silk precludes the possibility of the establishment of a silkworm industry in Ontario, and "serious disappointment will surely follow exaggerated ideas upon the subject of silk-raising for profit, and if any person is contemplating such a course he is very strongly dissuaded therefrom."

Dr. Fletcher spoke of the interesting character of the paper and said that the Government at Washington had given up its experiments with silkworms because the French manufacturers would not pay for the cocoons a price that would remunerate American labor. In France they kept the eggs in a cool place so that they might not hatch till the mulberry trees were in leaf; if they should hatch too soon they could be fed upon lettuce, but this food was not safe, as it often produced diarrhœa in the caterpillars. He referred to the fact that most schoolboys in England reared silkworms for amusement, and in consequence a very large number became deeply interested in entomology.

RESULTS OF SOME APPLICATIONS OF CRUDE PETROLEUM TO ORCHARD TREES.

By F. M. Webster, Wooster, O.

The varying and sometimes disastrous results obtained from the use of refined petroleum, on growing trees, as an insecticide, and especially against the San José scale, has led to the suspicion that the crude product might be less variable and drastic in its effects

But so far as it has been used it would appear that we have yet much to learn, before we can, with safety, recommend the application of the crude product to the different varieties of fruit trees. That it is efficient in destroying the San José scale, if it is brought in contact with this insect, seems now quite probable. But the hundreds of dead trees that mark the areas where it has been indiscriminately used, point very clearly to the fact that great caution is necessary, and no one is, as yet, able to say just where safety ceases and danger begins Then, too, when no permanent injury is apparent, as in the case of the seedling apples on the grounds of the Ohio Agricultural Experiment Station, at Wooster, Ohio, who can say that this unnatural retardation may not, after the first application prove to be a menace to the life or general vigor of the trees? It is well known that, in nature, these retardations sometimes occur, but nature seldom, or never, covers the bark of a tree or a shrub, and then only in part, with vegetable growths like lichens, and even these are known to be detrimental, a smooth, clean bark being always desirable.

In the use of refined petroleum, one of the most perplexing phenomena observed was the fact that, equally careful applications, made by the same person, with the same grade of oil, would give almost opposite results. Hence, recommendation of the refined product for general use has, in many cases, resulted disastrously and brought no little disrepute to the entomological fraternity of this country. The most that can now be said for the refined product is that a ten to twenty per cent mixture with water constitutes a fairly successful summer wash and destroys the young scale, thereby checking the increase and spread until applications of whale oil soap mixtures can be made.

In the use of the crude product, I have seen some of the most astonishing results obtained, but, as with the refined, I have seen also the most disastrous effects. Perhaps the uncertainty of effects in using crude petroleum in the orchard may be best illustrated by giving the results obtained, this year, by Mr. N. A. Hadden, of Catawba Island. Mr. Hadden used crude petroleum on the strength of recommendations from New Jersey, including those published by Prof. John B. Smith, and contrary to the advice of some of his neighbors. As I knew nothing of the matter until some weeks after the latest applications, nothing could have been said or done by me to in any manner influence Mr. Hadden, who followed his own course, and, I may add, has offered me every facility for observing the final results.

About 50 peach trees of the Crawford's late variety were sprayed March 10, 1900, with 100 per cent crude petroleum from an oil well near Gypsum, Ottawa County: Distillation B. The spraying was carefully done and none of the petroleum was allowed to run down the trunks of the trees. The effect on these trees was to kill every one of them. Two other blocks of peach trees on which crude petroleum from the same well was used, were also totally destroyed. On the same day, March 10, 1900, six plum and one peach tree were sprayed with crude petroleum from the same well and of same strength. Two unhealthy plum trees died; the other four were uninjured, as was also the peach, which not only made a vigorous growth but bore several peaches. Several rows of Smock and Salway peaches were sprayed April 7th with 100 per cent. crude petroleum, and, though not showing serious injury on May 16th, in July 90 per cent were dead and the remainder fatally injured. Crawford's Late, sprayed March 8th with 10 per cent. crude petroleum, and another block sprayed with a 40 per cent. mixture, were not seemingly injured, but bore no fruit. Eight apple trees and several peach trees, sprayed March 8th with 10 per cent. crude petroleum, were uninjured.

On the premises of C. W. Shoemaker, at Waterville, Ohio, there stands a Wilder Early pear tree, that for several years was badly affected with the Scurfy Bark louse. The tree was stunted and made little growth each year. Two or three years prior to 1900 the tree was sprayed in spring with kerosene emulsion, which killed many of the insects, and the tree afterwards made a better growth than it had previously done. April 2nd, 1900, this tree was painted with crude petroleum, the analysis of which I have not been able to secure On August 17th, 1900, I saw the tree, and the bark still gave good evidence, by its colour and shining appearance, of the presence of the petroleum. The growth has been vigorous and the foliage was of the most healthy colour. The Bark-louse seemed to have been quite exterminated.

On March 23rd, 1900, a row of three year old seedling apple trees, on the Station grounds near Wooster, was treated with crude petroleum of different strengths, applied with a Deming kerosene attachment, the applications being made by two of my assist ants, Messrs. Newell and Roudebush. This petroleum was taken directly from oil wells at Lodi, Southern Medina county and its chemical composition is shown in "analysis A." Different trees were sprayed with different strengths of the oil, varying from 10 per cent. crude pretroleum and 90 per cent. water, up to 100 per cent. crude petroleum. In no instance were the trees permanently injured. The effect was simply to retard the development of the foliage, until about the middle of May. May 7, many varieties of apples were in full bloom. The Winesap and Rome Beauty were showing their first unfolding blossoms. Strangely enough, the effect was rather more marked where the 10 per cent. solution was used. Where we used the 40 per cent. the retardation was less than where we used the 20 and 50 per cent. crude petroleum; the effect of the 40 per cent. being about the same as the 100 per cent The 30 per cent. was almost the same in its effects as the 10 and 100 per cent. mixtures. June 13th, an examination of the trees showed that the normal amount of foliage had been put forth, and the leaves were exceedingly healthy in appearance and seemed larger than those on the unsprayed trees. An examination of the trees the middle of October showed that the first sprayed trees were really holding their foliage better than the unsprayed. Nearly all of the leaves had dropped from the latter while scarcely any had fallen from the sprayed trees. The tree sprayed with the 100 per cent. crude petroleum seemed to have held its foliage better, and the colour was more fresh and vigorous than on those sprayed with the diluted petroleum.

While all this indicates that crude petroleum may be used once upon apple with a strong probability of no detrimental results occurring from its use, nevertheless, the question is yet to be settled as to whether one or more additional applications will result in the same way. It seems to me that this whole matter has not yet reached the point where we will be justified in saying to the public it will be safe to use the crude petroleum. The practical question is not whether an expert can use this as an insecticide with safety, but whether it can be safely trusted in the hands of inexperienced men who are not trained in exactness of methods or quantities. I do not wish to be understood as in the least denying that there may be something in both crude and refined petroleum that may, in the future, have great value as an insecticide, but that, for the present, we should be content with investigations, and be exceedingly cautious in regard to recommendations until we have at least found out the reason for such widely diverse results being obtained from applications so nearly alike in point of materials and methods.

It must be remembered that our experiments with crude petroleum at Wooster, Ohio, were made upon seedling apple trees, which, though they might have possessed different degrees of resistibility, might, on the other hand, have been less susceptible than any of the grafted varieties. The selection of these trees was not a matter of choice, for they were the only ones available at the time. Next year, we shall endeavour to reverse the experiment; that is, where the 10 per cent. mixture was used this year we shall use 100 per cent. next year, and vice versa. A large number of experiments are also to be carried out upon different varieties of apple, in different parts of the State, using different strengths of the crude petroleum.

PETROLEUM DISTILLATIONS.

	A	B
Specific Gravity	35°B	34°B
Light Naptha, 80°C	1.49%	.14%
Heavy " 80° to 120°C	4.35	1.63
Benzine, 120° to 150°C	5.03	3.82
Light burning oil, 150° to 200°C	7.64	13.48
Heavy burning oil, 200° to 250°C	13.54	12.03
Residue from 250° Dist	68.70	68.62
	100.74%	99.72

A, from Lodi, Ohio, well. B, from Gypsum, Ohio.
Distillations by J. W. Ames, Asst. Chemist, O.A.E.S.
B contains sulphur compounds.

INJURIOUS INSECTS IN ONTARIO DURING 1900.

By Dr. James Fletcher, Dominion Entomologist, Ottawa.

The practical entomologist has had his hands full during the past season in Ontario. The season has been a most unusual one—hot and dry in some sections, but unusually wet in others. There have not been, however, any very remarkable outbreaks of injurious insects which have been the cause of widespread loss; but some of the old and well known pests have done a considerable amount of harm, much of which could have been prevented if farmers would only recognize that they have every year to reckon with the generally forgotten but always present tax collectors belonging to the insect world and that these always work in the same way. Orchard insects, which could have been controlled by spraying, were neglected in many places, and Cutworms caused losses which could have been prevented. The Pea Weevil, every year abundant and destructive, seems this year to have been more so than usual, but the Destructive Pea Aphis was not so injurious as at one time it was feared it would be. Late in the season it was found that great harm was being done by the Hessian Fly throughout western Ontario, most particularly in early sown wheat. The Turnip Aphis was only locally prevalent. The San José Scale has spread over many orchards which were only slightly affected in the beginning of the season. The so-called Buffalo Moth is becoming a serious pest and is spreading.

Cereals.

By far the most serious outbreak among cereals was by the **Hessian Fly** (*Cecidomyia destructor*, Say, Fig 14, highly magnified) in fall wheat. Specimens of young wheat plants infested to a remarkable degree, some of the shoots containing nearly a dozen puparia, were received from Waterford, Ferguson, and other places. Very few reports of injury by the summer brood came to hand, so that this sudden appearance of the insect in such large numbers was somewhat of a surprise. Reports from correspondents show that late sown grain was to a marked degree less infested than that sown at the usual time in the beginning of September. The appearance of the perfect insects,—tiny blackish gnats not expanding more than a quarter of an inch from tip to tip of the outspread wings,—and the life history are so well known that it is not necessary again to go into details here with regard to these; suffice it to say that there are two broods in the year, the perfect flies of the first appearing in May and June, and laying their eggs on the leaves of the growing wheat plant The small maggots work their way down inside the sheaths of the leaves and attack the tissues of the growing stem, weakening it and frequently causing it to fall down, bending over just above the point of attack. The brown flax-seed-like puparia may frequently be found in straw or under the machine at the time of threshing Some of these flax seeds the number varying according to the season, produce the flies the same autumn, chiefly in the month of September; these lay their eggs on the newly sown fall wheat. Some of the flies of the summer brood, however, do not emerge until the following spring—at the same time as the flies of the autumn brood—and these lay their eggs on the young plants of spring wheat. This attack is frequently overlooked, owing to the fact that, if the wheat plants are not sufficiently advanced for the eggs to be laid upon the stem leaves, they are laid upon leaves close to the ground and the larvæ attack the root shoots and kill them before they have produced stems at all. I find that, as a general thing, there is a great deal more injury done in this way than on the stems of wheat. Farmers, as a rule with this attack, do not recognize their enemy and attribute the thin crop to "cold or wet springs," "late frosts," "hot suns," or other imaginary causes of which no exact record had been kept As stated above, there is this autumn a very serious attack by the Hessian Fly in our Ontario wheat fields, particularly in those sections where fall wheat is most largely grown. As a matter of fact, fall wheat can be grown in every county of the Province, and the Hessian Fly is liable to occur in any of these. Certain areas, however, from the

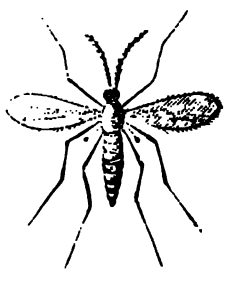
Fig. 14.—Hessian Fly.

satisfactory results are recognized to be particularly well suited for the cultivation of this cereal.

Many experiments by agriculturists have shown that better crops are reaped if the seed is sown early, that is, about the 1st of September. This, however, is only true in such years as the Hessian Fly is not prevalent. Therefore, it is decidedly advisable for growers of fall wheat to remember in such periods as the Hessian Fly is abundant, what the life-history of this insect is, and, instead of trying to sow their fall wheat seed by the 1st of September, delay this operation until after the 20th, being content to get a slightly smaller yield and to be sure of it, than, in the effort to get a bigger crop, perhaps run the risk of losing half or even the whole from the attacks of the Hessian Fly. By postponing seeding until the end of September, the appearance of the young plants above the ground is delayed until after the egg-laying flies of the second brood are dead. Where fall wheat has been sown in August and is already well up, it is considered advisable when the Hessian Fly is known to be prevalent to feed off a good deal of the green top with sheep during the month of September, in which manner it is claimed that many of the eggs are destroyed. Care must be taken that the fields are not cropped too closely nor too late in the season. Late sowing therefore may be claimed to be the most important preventive remedy against the Hessian Fly. There are, however, other methods of reducing the numbers of this insect, among the more important of which are the treatment of stubble and the burning of refuse. The treatment of stubble is of most use in such districts as Manitoba, where there is only one brood of the Hessian Fly, which is restricted to spring-sown grain. In 1899 the Hessian Fly appeared for the first time in Manitoba, where no fall wheat is grown, and did an enormous amount of harm. Fortunately, this year there is no recurrence of this attack. The insect passes the winter in Manitoba, for the most part, in the stubble, although some of the puparia are carried from the field with the straw. Therefore, if stubbles be burnt over or ploughed down deeply in autumn and the straw is fed to stock or burnt at any time before the flies emerge in spring, there being no autumn brood, this pest should not be difficult to control. The burning of refuse which is thrown down beneath the threshing machine, will also dispose of many flax-seeds of the summer brood which did not emerge in the autumn and were carried in the straw. If this refuse were not destroyed, these would give forth their flies the following spring.

In cases where fields are found to be infested with Hessian Fly, it is sometimes difficult to decide what a farmer's wisest course is. If the infestation is only light, it is sometimes possible to stimulate the crop by the use of a light application of some quick acting fertilizer. Where, as is generally the case, there are patches in the field which have been destroyed, it is desirable to save such parts of the field as are uninjured. These patches can be sown in spring to some crop which will not require cultivation, e.g. an early ripening barley, which can be cut at the same time as the fall wheat and the whole threshed as mixed feed If, however, it is necessary to save the wheat separately, peas may be sown on these patches, which can either be cut after the wheat, or the grain can be separated after threshing. In cases of bad infestation it would sometimes pay better to use the land at once for some other crop.

The usual practice of simply cultivating deeply so as to produce a good seed bed is an improper one, because the flax seeds are present and, if the land is only cultivated, the flies will emerge in spring and prove a source of infestation to the uninjured remainder of the wheat crop and also to any spring wheat or barley which may be sown nearby. Infested areas should be ploughed down deeply so that the flies when they emerge from the flax seeds shall be unable to work their way out Then any crop may be sown except spring wheat. Barley and rye are also sometimes liable to attack; consequently, other crops are preferable to these, such as oats, peas, corn or roots There will sometimes be cases where the farmer is uncertain what it is best to do, owing to the occurence of uninjured patches in an otherwise badly infested field. In these cases it will be best to wait and see how the wheat will turn out. If at last something else has to be substituted as a crop, probably the best returns will be obtained by sowing early ripening corn where a cultivator can be used, or early peas where the patches are surrounded by wheat. Both of these crops may be sown as late even as the middle of June and will give good results. Mr. N. H. Cowdry, a very careful observer, of Waterford, Ont., has noticed that different varieties of wheat are not injured to the same extent; for instance, in one field of Clawson wheat about eighty per cent. of the plants contained Hessian Fly puparia, while Democrat wheat near at hand was only injured to an extent of thirty per cent. Again, Clawson wheat was as a rule attacked in the upper and earlier sprout which was killed, but an uninjured sprout was growing from the seed. Democrat wheat, on the other hand, showed the original sprout uninjured or to a much less degree than the other variety, and the secondary shoot had not by the end of November so far been produced. Of the two fields the Democrat looked green and healthy, but the Clawson looked yellow and faded, and there was a great deal of rust on the leaves.

A yellow colour so often referred to by farmers as an indication of the presence of Hessian Fly is a sign by no means always to be relied on, for, as Professor Webster, of Ohio, has pointed out, infested plants are for a time of a brighter green and more stocky than those in a healthy condition. However, there are frequently in the autumn enough dead leaves and shoots to give the fields a brown and unhealthy appearance, and these together with leaves attacked by the fungous disease rust, which sometimes, as during the present autumn, is very abundant, may have been the cause of the appearance which is so often described as "yellow from Hessian Fly."

Cutworms in Grain.—There have been reports from restricted localities chiefly in the western counties, of injury to grain fields by the larvæ of the amputating brocade moth (*Hadena arctica*, Bdv.) and other cutworms.

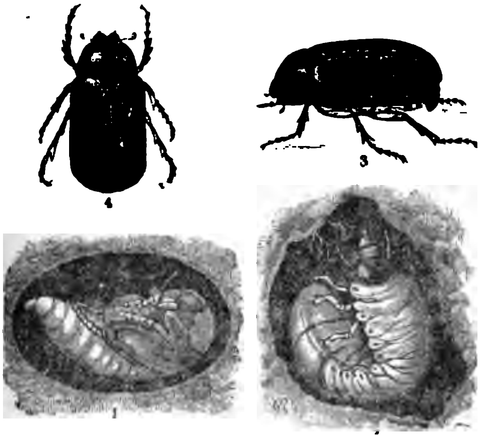

Fig. 15.—White grub: 1. pupa; 2. larva; 3 and 4. June beetle.

Wireworms are mentioned in several localities but no specimens have been sent in.

White Grubs The larvæ of the June beetles (*Lachnosterna*), (Fig. 15, 3 and 4), have done a good deal of harm not only in pastures but to some field crops in different parts of the province. Notwithstanding the very different appearance of these two kinds of grubs, I find that they are very frequently confounded with each other by farmers. Wireworms (Fig. 19), the larvæ of the Click Beetles (Figs. 16, 17, 18), are slender cylindrical shaped, tough-skinned, bright yellow, grubs, about one inch long by one-eighth of an inch, or less, wide. The two ends of the body are somewhat similar in general appearance; Fig. 20 represents the pupa of a wireworm, upper and under side. White Grubs (Fig. 15, 2) on the other hand, are much larger, heavy-bodied, almost sack-shaped, white grubs with yellow heads having the end of the body enlarged, curved down and brown from their earthy contents showing through the thin skin. If the body were straightened, it would measure an inch and a half or more, by three-eighths of an inch wide at the widest part. The duration of the larval life of these two insects is probably about the same. The eggs of the June beetles are laid in spring, and the young grubs feed all the first summer and through the second one, attacking the roots of all kinds of plants, but being most numerous in fields where there are trees, or round the edges of fields near trees. By the end of the second summer they become full-grown and change to beetles, but do not emerge until the spring of the third year. Wireworms begin their lives much less regularly at any certain time of the year; the perfect beetles belong to a very large number of genera and species, which occur through the season, and the eggs

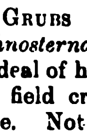
Fig. 16.

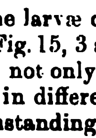
Fig. 17.

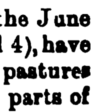
Fig. 18.

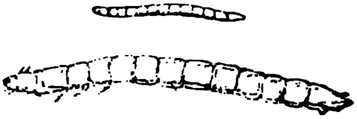
Fig. 19.—A Wireworm.

of some kinds may be laid at any time. The food of wireworms has a much larger range than is the case with the white grubs, many, and these are the most injurious species, feed upon the roots of grain and other crops, grass, shrubs and trees. Some feed on decaying wood and other vegetable matter, and some, at any rate occasionally, are even predaceous. On the whole, however, the class must be considered as decidedly injurious. In the beetle state Click-beetles (Fig. 21) are not considered very destructive but one species, *Corymbites tarsalis*, Melsh., has of late years been detected as a rather frequent enemy of the apple, feeding in the flowers and destroying the essential organs, and also eating the young foliage. As a general remedy for both of the above named classes of insects, late ploughing has been found beneficial, by breaking up the pupal cells at the time the insect is in a tender condition and exposing it to many dangers when it is either a pupa or an immature beetle, and unable to make another cell. The trapping of the mature Click-beetles by using pieces of potato poisoned with Paris green placed on the ground near where the beetles seem to be abundant is claimed by some experimenters to have been attended with considerable success. The June beetles are largely foliage eaters and are specially attracted to certain kinds of trees. Many may be destroyed by spraying these attractive trees with Paris green and lime, which may be applied as strongly as one pound of Paris green with two pounds of lime in 100 gallons of water.

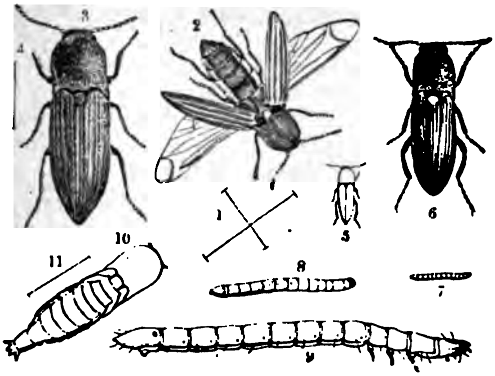

Fig. 21.—Click-beetles and Wireworms—2, 3, 6, 9, 11, magnified.

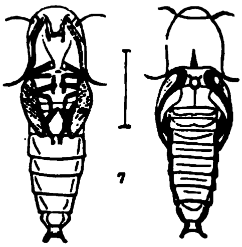

Fig. 20.—Pupa of Click-beetle.

THE PEA WEEVIL (*Bruchus pisorum*, L., Fig 22).—Year after year, the loss in the pea crop from that old and well known enemy, the Pea Weevil, is simply appalling. The life history is well known and it must be claimed that the remedy is practical, that is, effective, cheap and easy, and yet it is not applied regularly by pea growers as it ought to be. As far as I can learn, the large seed merchants and the large growers do fumigate their pease with bisulphide of carbon and destroy the contained insects. The trouble seems to be with the small growers and farmers who save a few bushels for seed and do not take the trouble to treat these small quantities. As is well known, the Pea Weevil comes to maturity in autumn and if the season is favorable emerges at that time of the year and passes the winter under rubbish and in out-buildings. Many, however, remain in the pease and do not emerge until the following spring, when they are frequently sown with the seed. The perfect insects are very active little beetles which fly easily to the pea fields about the time the blossoms appear. They feed for some time on the flowers and leaves. As soon as the young pods are formed, the females lay their eggs upon them, from which the grubs hatch and eat their way into the pod and penetrate the forming seeds.

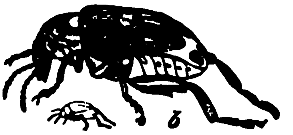

Fig 22.—Pea Weevil—greatly enlarged, and of natural size.

Remedies: The best remedies for this insect are the treatment of the seed with bisulphide of carbon, late sowing and the holding over of seed. Fumigating with bisulphide of carbon is the method now generally adopted by seed merchants and most of them have special houses for "bugging pease." Farmers can easily make use of this same method by taking an ordinary 45 gallon coal oil barrel which will hold five bushels of pease. According to the quantity of seed to be treated, one ounce of bisulphide is used to every 100 pounds of pease, that is three ounces if the barrel is filled. The chemical may be either placed in a flat open basin on the top, or it may be poured directly on to the grain. The top of the barrel must be quickly replaced and covered up with cloths, etc., as tightly as possible. This treatment should be carried on in a shed out of doors, and the barrel must not be opened for 48 hours. Bisulphide of carbon is a colourless malodorous liquid which volatilizes readily at ordinary temperatures. The vapour is quite invisible, but being heavier than air it sinks readily and permeates the contents of the barrel. It is very inflammable and care must be taken when using it that no light of any kind is brought near. This treatment should be done in the autumn as soon as possible after the pease are threshed and before the weather has become cold. The sooner the treatment is done, the less injury the weevils will have done to the seeds, and, if the bisulphide is not used until cold weather has set in, its effect upon the insects is very much less than when they are in an active condition. Moreover, by delaying treatment there is the risk in mild autumns that the beetles may have attained full growth and left the seeds. The late sowing of peas is useful in preventing attack by weevil, but the method is not in favour with farmers because late sown peas in certain seasons are liable to be so much attacked by mildew as to reduce the crop sometimes more than would be done by the weevil. The holding over of pease until the second year, keeping them in close bags to prevent the escape of the beetles, is certainly a good remedy and is not practised by those who use small quantities of seed as much as it ought to be. The reduction of vitality of seed pease held over for one year is very little indeed. Unlike the Bean Weevil, the Pea Weevil cannot propagate in the dry seed so that every beetle which emerges dies inside the sacks. Before sowing, the injured seeds must be separated and only those which are perfect planted.

THE PEA MOTH (*Semasia nigricana*, Steph., Fig. 23).—In the eastern counties of Ontario and extending down through Quebec into the Maritime Provinces, much harm has been done by the caterpillars of the Pea Moth. They have been particularly abundant at Ottawa this year in late peas. As this insect resembles the Codling Moth very much in its methods of attack, some experiments were tried at my request by Mr. J. E Wetmore, of Clifton, N.B., by spraying the vines when the young pods were forming with a Paris green mixture which had been rendered adhesive by the addition of whale-oil soap. The results from these experiments, although not conclusive, are of a hopeful character and will form the basis of further experiments next year.

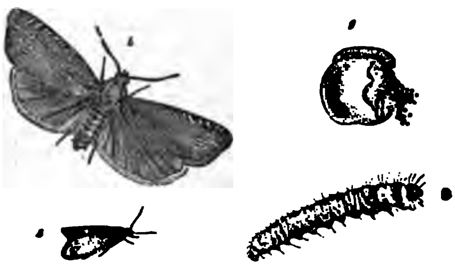

Fig. 23.—The Pea Moth—natural size and enlarged.

THE DESTRUCTIVE PEA APHIS (*Nectarophora destructor*, Jnsn.).—This insect which was the cause of such extensive injury to the pea crop last year not only in the southern States but extending further north into Canada, has this year not been so bad as in 1899 but still has caused considerable loss. In the eastern counties the larger number of attacks have been noticed. The J. H. Allan Seed Company, of Picton, reports that "this season it has done considerable damage in New York State, Michigan and Wisconsin. Last season as well as this it caused injury in Prince Edward County as well as in Lennox and Addington. We are also told that it did much damage in Renfrew County." Last year in the State of Maryland the loss from this insect was put at $3,000,000, and during the past summer the loss in the same crop much exceeded that amount. Moreover, not only did this insect attack the pea crop but it was found to be much more distinctively an enemy of clover. This attack upon clover was not serious in Canada, and at Ottawa, where plots of peas were entirely destroyed by it, clover plots closely contiguous showed no sign of the presence of the aphis until very late in the season, when all peas had been killed by frost (November), and when a few were found. Many remedies were experimented with by Prof. Johnson, State Entomologist of Maryland, the describer of the species, and it was found that what has been called "the brush and cultivator method" was the most effective. For this it is necessary that the peas should be sowed in rows from 24 to 30 inches apart, and not broadcasted. He says, "The vines were brushed backward and forward with a good pine switch ahead of an Iron Age cultivator, which was drawn by one horse, and in this manner the insects which leave the vines freely when these are shaken were covered up and a large proportion of them destroyed." The cultivation was not repeated until the third day, as it usually required 48 hours to destroy the insects when covered with earth. Another method which was tried with considerable success, consisted of a brush which dislodged the insects so that they fell into a pan containing coal oil and water, and dragged between the rows. In this way a bushel of plant lice were caught to each row of peas 125 rods long. Spraying was tested, but it was abandoned because no spray could be found which would destroy a large enough percentage of the insects to warrant the expense of the operation. An extensive experiment, however, covering 600 acres where the plants were brushed and cultivated every third day for a period of two weeks, forty men being employed, was very successful. In this manner the entire field was saved, netting the owner from 25,000 to 30,000 cases of peas of two dozen tins each. It is also stated that a field not far distant where nothing was done, was totally ruined. As is usually the case with all kinds of plant lice when they occur in excessive numbers, the Destructive Pea Aphis has been vigorously attacked by many kinds of parasites, which at Ottawa, at any rate, have had a remarkable effect in reducing its numbers Although the plant lice were extremely abundant in some places, they were almost totally wiped out on one or two occasions by certain of these enemies. The most useful parasite at Ottawa was a small dipterous fly, probably of the genus *Diplosis*. The small orange maggots of about a sixteenth of an inch in length crawled about among the colonies of plant lice and destroyed them in large numbers, piercing their bodies with their mouth parts and sucking out their juices in the same manner as is done by the larvæ of Syrphus flies. When full-grown these larvæ spin a small close cocoon either in the angles of the leaves or stem, or falling to the ground make a cocoon of silk with particles of sand attached. There were continuous broods of this useful parasite throughout the season, and the minute gray midges could be seen about the infested plants at all times. The last brood spun their cocoons in the middle of October, and the larvæ will remain in them until next spring. Several species of lady-bird beetles, Syrphus flies and lace-winged flies were also abundant, as well as species belonging to the hymenopterous genera *Praon* and *Aphidius*. The first of these emerges from its host and spins a cocoon beneath the dead body. The latter passes through all its stages inside the body of the plant-louse and when mature eats its way out through a circular hole.

FODDER CROPS.

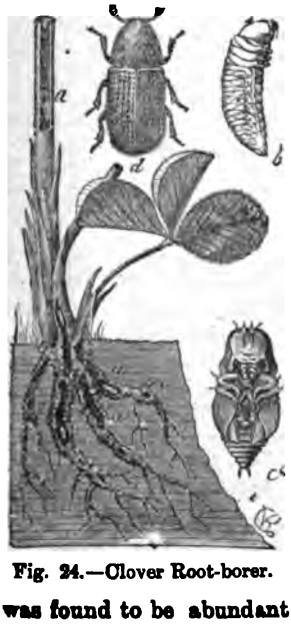

Fig. 24.—Clover Root-borer.

THE CLOVER ROOT-BORER (*Hylastinus obscurus*, Marsh = , Hylesinus trifolii, Muell., Fig. 24).—The Clover Root-borer generally occurs in a few localities in Canada every year, but is seldom the cause of much harm and this will be more and more the case not only with this species, but with the Large Clover Weevil (*Phytonomus punctatus*), as farmers get more into the way of sowing clover to a larger extent as a green fertilizer and plough it down after the first crop. During the past summer the Clover Root-borer was observed doing some harm in old fields of clover but also in some new ones right across the province. The worst occurrences were near London, at Picton and in a small patch at Ottawa. Clover which is infested flowers irregularly and the plants have an unhealthy appearance. The insect may be found in autumn in all stages in the roots of clover plants; the beetle comes to full growth late in autumn and remains in its burrows until the following spring. The remedy for this insect is a short rotation. The value of clover as a fertilizer is now so well known that farmers do not hesitate to plough down their meadows as soon as they find traces of this insect. This should be done as soon as there is a pretty good growth on the ground after the first crop of hay has been removed.

THE LARGE CLOVER WEEVIL (*Phytonomus punctatus*, Fab.) was found to be abundant in the larval condition in a field, near Picton, Ont., which was also infested by the Clover Root-borer. These larvæ, however, were almost all attacked by the fungus *Entomophthora phytonomi*, Arthur. Almost every blade of grass rising above the clover had at its tip a dead or moribund larva, and of a large number which were apparently healthy, collected for rearing, there was hardly a specimen which produced the beetle. The diseased grubs were of all sizes from very small to full-grown. This was on the 24th of May. A few of the full-grown larvæ taken at that time spun their lace-like cocoons in the beginning of June and two beetles emerged about the end of the month. The beetles measure over four-tenths of an inch in length, are oval in shape and of a brown colour with four pale punctured lines on the sides. The beak is rather short and blunt, the thorax smooth and swollen with three pale lines. The wing cases each bear ten deeply impressed lines of punctures, from which the species takes its name.

Roots and Vegetables.

A great number of insects have been complained of during the past season as having attacked more or less root crops and vegetables. Some of the more important of these are the following:

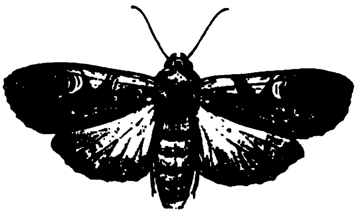

Fig. 25.—Moth of Spotted Cutworm.

Cutworms—The Spotted Cutworm, as the larva of *Noctua C-nigrum*, L, Fig. 25, has been inappropriately called, was extremely abundant in many localities along the north shore of Lake Ontario, injuring all kinds of garden and root crops. This is never a rare insect, but this year it was enormously abundant. The brood of which larvæ are found during July, was the one this year which did most harm. This species seemed to take the place in Ontario and resembled very much in its habits and time of appearance, the Variegated Cut-worm, *Peridroma saucia*, of which there has been a disastrous outbreak this summer all through the Province of British Columbia. The larva of *Noctua C-nigrum* is grey or pale brownish of varying shades. When full-grown it is nearly an inch and three-quarters long, rather slender, being less than a quarter of an inch at its widest part. The markings are difficult to describe, and vary very much in intensity. There is always a pinkish sub stigmatal stripe, and the whole of the dorsal area is more or less crossed and darkened by indistinct blackish blotches or mottlings, which on each segment on the dorsum take somewhat the shape of the letter "M" with the top pointing towards the anal end. In some specimens there is a supra-lateral row of spots on each side gradually increasing towards the anal end both in size and intensity of velvety black. On the last segments these are elongated angular blotches with the apex pointing forward. There is also a narrow medio-dorsal pale line and a pale lateral line on each side. However, no two specimens agree exactly in ornamentation, but all have the appearance of being covered with a course network of black more or less obsolete over a pale brown ground colour. The moths appeared in large numbers from July till the end of the season and it is most probable that the eggs are laid in late summer and autumn and that the larvæ hibernate half-grown.

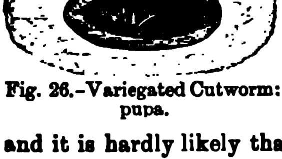

Fig. 26.-Variegated Cutworm: pupa.

The Variegated Cut-worm (*Peridroma saucia* Hbn.) was also found in considerable numbers, the large caterpillars nearly two inches long by over a quarter of an inch wide, attacking all garden plants and also doing harm in orchards upon apple trees. Some pupæ of this species (Fig. 26) with the moths ready to emerge were found at Ottawa in the beginning of November, but the weather changed immediately afterwards, and it is hardly likely that the whole of this brood produced moths before winter set in. The life history of this species in Canada as to hibernation is not definitely known from actual observation, but from the above incident it would appear as if moths which emerge in July and August, must lay their eggs (Fig. 27) and the larvæ hibernate partially grown. Moths which emerge in October and November probably pass the winter in that condition, and it would also appear as if some must remain in pupa until the following spring.

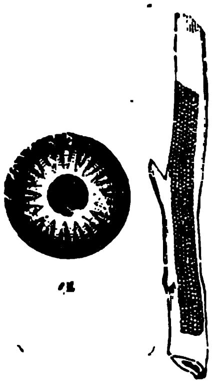

FIG. 27. — Variegated Cutworm: *a*, single egg, highly magnified; egg cluster on twig.

The remedies for cutworms which have given the best results are the banding of freshly set out annual plants, either with rings of paper or tin, so that this protection extends down about an inch beneath the surface of the soil and an inch and a half or two inches above it. Faded leaves which hang down and touch the ground must be cut off. This protection is particularly applicable for cabbages, tomatoes and tobacco. For clearing infested land either just before planting or when a crop is found to be attacked, the now well known mixture of bran and Paris green gives excellent results. This mixture may be applied either wet or dry. In the latter method the bran should be slightly dampened with water containing 2 or 3 ounces of sugar to the gallon of water. After mixing thoroughly so that the whole mass may be slightly moist, but at the same time feel dry to the touch, dust over it a sufficient quantity of Paris green, green arsenoid, or some other similar poison, to give the mixture a slightly green colour. In the former recommendations it was advised to add the Paris green to the bran in a dry condition; but this is not satisfactory, because on account of the weight of this poison it sinks at once to the bottom when stirred. The bran or meal mixture should be sufficiently dry to run through the fingers easily. It should then be placed in small heaps a few feet apart where the cutworms are thickest and will be greedily eaten by these insects. This is merely a modification of Prof. Riley's trap remedy which has been used successfully for many years. This consists of tying up in small bundles any green succulent vegetation such as any luxurient weed which may be growing by roadsides, and after dipping them in a strong mixture of Paris green and water, distribute them over the land or along the rows of a crop. The greatest drawback to this method of fighting cutworms is the fading of the plant used. This may be prevented to a certain extent by placing a shingle on the top of each, which has the double advantage of attracting the cutworms as a hiding place, and of preventing evaporation from the bundles. It is seldom that plants attacked by cutworms can be treated successfully by spraying, except in the case of climbing cutworms in orchards.

CABBAGE WORMS —The cabbage crop during the past season has suffered from several enemies. The root maggots caused great havoc in many places among cauliflowers and early cabbages. The Diamond-back Moth (*Plutella cruciferarum*, Zell) was abundant and destructive in dry districts to cabbages, turnips and rape, but the worst enemy of the cabbage crop this year was the White Cabbage Butterfly (*Pieris rapæ*, L.), the green caterpillars of which were so numerous from Peterborough westward almost to Hamilton and also at Ottawa and other places, as to reduce seriously the crop of turnips which, owing to the leaves being destroyed, could not "bulb" Cabbages in fields and gardens were also seriously injured. There are always every year certain insects which are liable to increase and do harm, but the Cabbage Butterfly is one which may be treated with comparative ease. The caterpillars are particularly susceptible to the effects of pyrethrum insect powder, and, if a mixture be made of one pound of this powder with four pounds of cheap flour and the whole be kept for twenty-four hours in a tightly closed jar or canister, and then dusted over the plants, it will kill all of the caterpillars upon which it falls, without injury to the plants and without danger to those who consume them. The proprietary mixture known as Slug Shot has also proved very deadly against "cabbage worms," as these caterpillars are generally called, but this must only be used early in the season while the plants are small, as it contains poison. This insect was probably more abundant during the past season than it has ever been noticed before, but toward the end of the summer it was destroyed in enormous numbers by an epidemic bacterial disease. Caterpillars which were attacked, first assumed a pallid or bluish white appearance and then gradually turned brown in blotches which enlarged until the whole body was a putrid mass. This disease was at its height in the beginning of September and continued to the end of the season. The spread of the White Cabbage Butterfly has been very rapid. It is said to have been imported into America first at Quebec about 1858, from which point it has spread in every direction. Although it had reached the Pacific coast in the United States some years ago, it is only during the past summer that it has appeared as an enemy of the cabbage grower on the coast in British Columbia.

The first record for that province was by Mr. J. W. Cockle who found it at Kaslo in the Kootenay district last year.

The DIAMOND-BACK MOTH (*Plutella cruciferarum*, Zell.) seldom does very much harm in Ontario but in the West it is terribly destructive to all crops belonging to the Cabbage family, and, owing to the fact that the caterpillars feed almost entirely beneath the leaves, it is extremely difficult to apply an effective remedy. The best results have been obtained with dry powdery mixtures containing poison, blown between the leaves by means of agricultural bellows and insect guns. For this purpose, a strong mixture of one pound of Paris green in 25 pounds of air-slaked lime, or perfectly dry flour, gave good results If liquid applications are used, a sufficient quantity of soap must be added to make them adhere to the foliage of such plants as turnips and cabbages, and a nozzle on an angled support must be used so as to throw the spray well up under the leaves. A knapsack sprayer with a cyclone nozzle answers well for this purpose.

The ROOT MAGGOTS (*Anthomyidæ*).—These troublesome insects have as usual done a great deal of harm and many experiments have been tried to secure a practical remedy. Unfortunately no very good results have been obtained. Onions, cabbages of all kinds, beans, corn and radishes have suffered. Mixtures containing carbolic acid in some form seem to be the most hopeful. Whale-oil soap gave tolerably good results. The most satisfactory experiments were with early cauliflowers which were protected to a large extent by means of the Gough Tar-paper Discs. These consist of a disk of ordinary tarred building felt with a split from the margin to the centre so as to allow of their being placed around the stems of newly planted cauliflowers. The odour of the tarred paper preventing the flies from laying their eggs, and the tarred paper disc also had the effect of holding moisture around the roots and inducing a copious growth of young rootlets, which were of great service in helping lightly attacked plants to outgrow the injury.

ASPARAGUS BEETLES.—The two species of Asparagus Beetles which were mentioned in our last report are still present in the Niagara district and together with the Asparagus Rust have done a certain amount of harm. Fig. 28 represents *Crioceris asparagi*, L., eggs on plant, larva and beetle. They have not, however, spread through the district to the same extent as it was thought they would last season, judging from their sudden appearance in the country in such large numbers. Asparagus growers seem to have grasped the idea of fighting them as larvæ, and a great many beds were dusted regularly with fresh lime when the larvæ were upon them. This seems to have been the remedy which was most used.

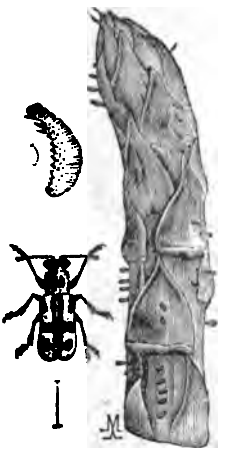

Fig 28.

TURNIP APHIS (*Aphis brassicæ*, L.).—There has been a decided absence of the Turnip Aphis in most parts of the Province during the season of 1900, except up in the north-western counties. In some places in Huron County the loss has amounted to about half or more of the crop. The eggs for this species are laid in large quantities on the old leaves of the turnips, and where these are cut from the plants and left in the fields it would be well to plough them down deeply, so that the young plant-lice when they hatch in spring would be unable to get out. It would of course be well also to avoid planting a crop of the Cabbage or Turnip family on the same land the following year.

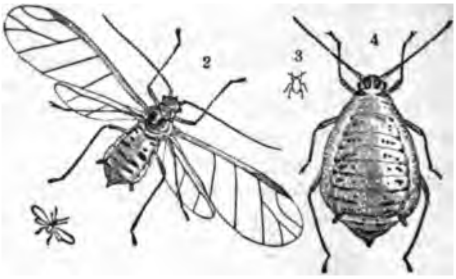

Fig. 29.—Turnip Aphis.

FRUITS.

The large amount of attention which has been devoted to fruit trees and orchard pests consequent upon the accidental introduction into Canada of the San José Scale, which is discusssed fully in another part of this Report, has had a decidedly good effect in stirring up fruit growers to attend more carefully to their orchards. Spraying has been more regularly and generally done for leaf-eating insects and Codling Moth Late fall and early spring applications have been made for scale insects and all the operations of the orchard seem to be better attended to than was formerly the case. Fruit growers are learning the habits of many of their regular pests, and there is a much greater demand for information about injurious insects than was the case only a year or two ago.

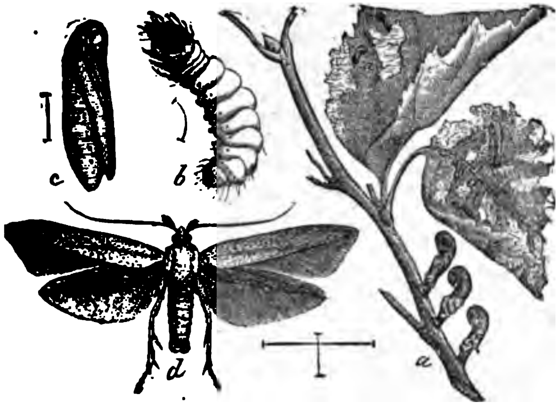

Fig. 30.—Apple Pistol Case-borer.

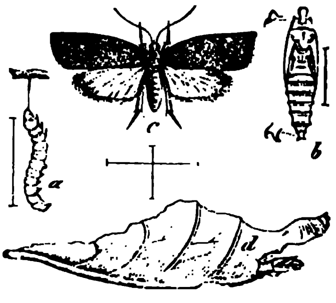

Fig. 31.—Apple Leaf-Roller (*Teras minuta*, var. *cinderella*.

The Codling Moth and Plum Curculio do not seem to have been so destructive, judging from reports received, as usual. The Tent Caterpillars which have been so abundant all through the Dominion were decided less destructive last spring. The Eye-spotted Bud moth and Oblique-banded Leaf-roller did their share of mischief, and early spring insects were rather more than usually troublesome along the shores of Lake Ontario. The Cigar Case-bearer, the Apple Pistol Case-bearer (Fig. 30) and leaf-rollers (Fig. 31) were about equally abundant and where neglected did harm. The species of leaf-roller which seemed to do the most harm was *Lophoderus quadrifasciana*, Fern. From Hamilton larvæ of the Palmer Worm (*Ypsolophus pometellus*, Harr.) were sent at the end of June, and a little later the same thing was sent in from Oakville. This is rather an unusual pest in Canada and had attracted attention from the extreme activity of the caterpillars. The Rose Chafer was reported as troublesome on apple trees at Niagara and Grimsby, and the Clover Mite did considerable harm to fruit trees all through the western counties where it was generally reported as "Red Spider." Cankerworms were destructive in restricted localities during May and early June. The species of which specimens were sent in, proved to be the Fall Cankerworm. The Basswood Looper (*Hybernia tiliaria*, Harr.) Fig. 32 was particularly abundant in the Ottawa district, attacking not only apple trees but various forest trees, especially the maple, elm and basswood. In western Ontario, especially in the Niagara district, an interesting little moth, the larva

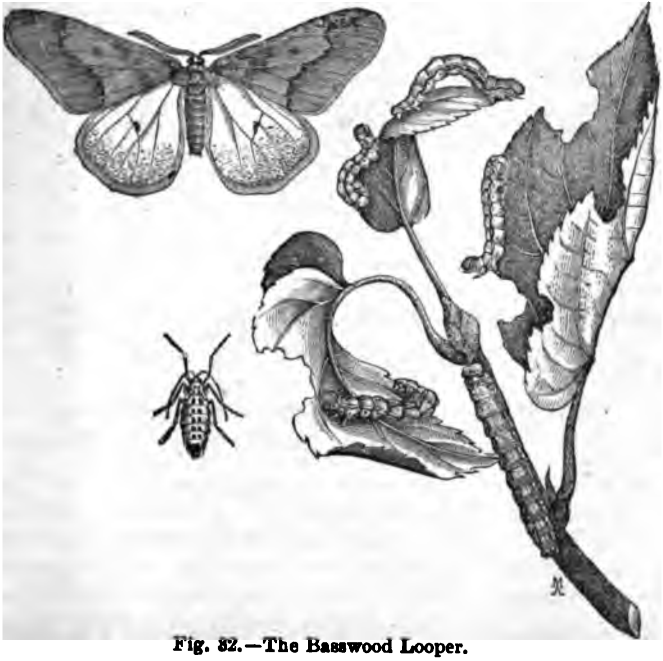

Fig. 32.—The Basswood Looper.

of which mines in apple leaves and sometimes does rather noticeable injury when abundant, is *Nepticula pomivorella*, Pack. The larva when full-grown leaves its mines in the foliage and spins small scale-like brown cocoons on the twigs where it passes the winter. This insect was formerly placed in the genus Micropteryx but it has been discovered by Mr. Busck of Washington that it is a true *Nepticula*.

Pear trees have suffered rather more than usual from three of their enemies. The Cherry Slug in some places has stripped the green cellular parts from the foliage to such an extent as to render the leaves quite useless to the trees, and as a consequence the fruit was ruined. This insect can be very easily kept in check either by spraying with arsenical poisons or by dusting constantly with freshly slaked lime. The Pear Psylla was particularly troublesome at Freeman, near Hamilton, and through the western counties. Mr. Geo. E. Fisher considers this an insect which requires much more attention than up to the present it has received. The mature insect hibernates beneath the flakes of bark on the trunks and larger limbs and can be destroyed during the winter by a 30 per cent. mechanical mixture of crude petroleum and water, or by the ordinary kerosene emulsion. The Pear-leaf Blister-mite is not quite as bad as it was a year or two ago but still is much more abundant than is good for the pear trees or the pocket-book of the fruit grower. On the Pacific Coast this insect is kept well in check with the lime, sulphur and salt mixture. This mixture has not been used very much in Ontario but the well-known kerosene emulsion sprayed over the infested trees just as the buds are bursting has been found very effective. Doubtless the mixtures of crude petroleum and water which are now coming so much into use will be found very effective against the Pear-leaf Blister-mite as soon as the proper portion to use with safety has been discovered.

INSECTS OF THE SEASON OF 1900.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

In looking backward over the entire season of 1900 it would appear that insect pests were more numerous and produced greater losses than usual. It is very difficult to determine the exact causes which were operating to produce the results, and valuable indeed would be trustworthy observations along this line. Perhaps the dryness of the season which prevented serious outbreaks of fungous diseases operated on behalf of the insects; perhaps the mildness of last winter enabled many more forms than usual to pass through the dormant season; perhaps parasites were not so numerous as usual; but whether there was one cause or a combination of causes the number of injurious insects was on the increase during the past season. Mention will be made of a few of the most injurious forms brought to the writer's attention chiefly by farmers and others in correspondence with the Biological Department of the Ontario Agricultural College.

ORCHARD INSECTS.

THE FRUIT BARK-BEETLE (Scolytus rugulosus). Complaints have reached us from Kingsville regarding the injuries done by this beetle. It attacks especially plum trees, and many of Mr. J. D. Wigle's trees died from the injuries. It is probable that trees in other sections are likewise affected, and watchfulness is required to prevent surrounding trees from becoming infested. From breeding experiments carried on at the College the writer finds that the adults appear about the middle of May. They bore holes through the bark into the wood, and proceed to make burrows in which to deposit eggs. The young grubs also make burrows, and within a month the beetles appear. Several broods may appear in a season so that the trunk soon becomes honeycombed with tunnels and dies. See Fig. 3 (on page 35) which represents the work of an lied species (S. destructor).

Badly infested trees should be cut down and burned, while those but slightly infested should be sprayed with whitewash, or with a mixture of whale-oil soap and carbolic acid.

THE SAN JOSE SCALE (Aspidiotus perniciosus). This pernicious scale is still with us in abundance, and in spite of the treatment of last spring it is just as numerous as it was last fall. Many new infestations have also been discovered, so that the whole problem of treatment will have to be taken up anew. Mr. Fisher, Chief Inspector, considers crude petroleum more effective than whale-oil soap in killing the scale, but Prof. Webster, of Ohio, maintains that crude petroleum is too dangerous a remedy to put in the hands of the ordinary fruit-grower, and accordingly prefers whale-oil soap. The scale is here to stay and the sooner the orchardist recognizes this fact, and the need of effective treatment to keep it in check the better will it be for the fruit industry of the Province. A great industry is at stake. Can we afford to lose this great industry?

GARDEN INSECTS.

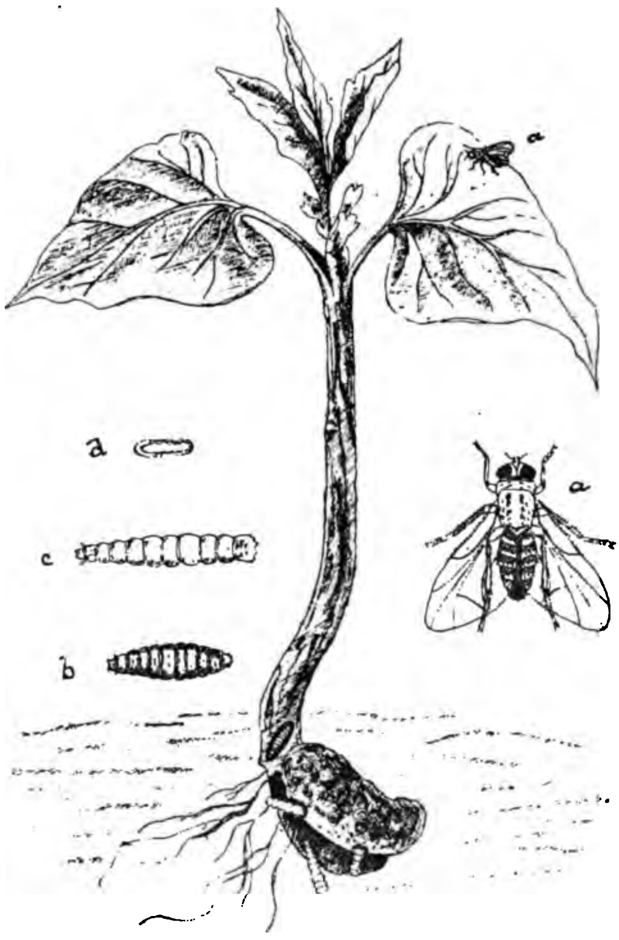

Fig. 33.—The Bean Fly— (a) adult flies; (b) pupa case in ground; (c) maggot; (d) an egg. (After Lugger).

THE BEAN FLY. (Anthomyia radicum)–In June many complaints reached the office regarding the attacks of grubs on beans in Lambton County. One correspondent wrote that hundreds of acres of beans were being destroyed. Many of the beans did not germinate at all, due to the fact that the maggot ate the interior of the seed, and many of the stems never developed leaves through the destruction of the central portion of the stem. Figure 33 shows very well the nature of the work of the maggot both in the seed and the stem. The maggots are about one-fifth inch long and yellowish-white in color. They taper to a point in front and broaden out behind. After feeding for a while the maggots descend into the ground, and change into barrel-shaped pupae. A week or ten days later the flies emerge from the pupa cases and proceed to mate and deposit eggs. After June no further complaint was made, although many growers had replanted their fields. No remedies could be suggested beyond replanting as early as possible, and not as deep as usual. It is just probable that the deep planting of the seed beans was the direct cause of the injury by the maggots, for the usual food of these creatures is decaying matter. The beans began to show signs of decay, and the maggots took kindly to their new food-supply.

Cutworms. (Noctua c-nigrum, Peridroma saucia, and others.) These night-intruders worked considerable damage in gardens and fields during June and July, but the spreading broadcast of handfuls of bran mash, poisoned with Paris green and sweetened with a little sugar, generally put a stop to their depredations in gardens. The most common forms sent in for identification were The Variegated Cutworm (Peridromia saucia), and The Spotted Cutworm, (Noctua c-nigrum).

Asparagus Beetles. (Crioceris asparagi, Fig. 34, and O. 12-punctatus).—Mr. W. N. Hutt, B. S. A., of Southend, reports to me that O. asparagi appeared very early, just as the first young shoots of asparagus were pushing through, and were three or four times as numerous as last year. The C. 12-punctata appeared two weeks later than the common species, and were even more numerous. The Department sent out a circular in early spring to the newspapers of the Niagara District, which explained clearly the methods to be adopted in combatting the asparagus beetles, but it would seem as if many gardeners failed to pay much heed to the instructions.

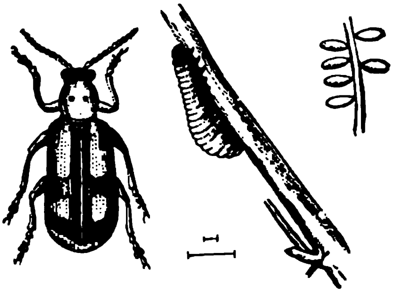

Fig 34.

The westward progress of these beetles has not been very noticeable this year, for although abundant around St. Catharines and Niagara, they have not been observed at Grimsby or Winona. Mr. Johnston reports them, however, from Bartonville, which lies between Winona and Hamilton.

The Bumble Flower-Beetle (Euphoria inda). Fig. 35. This beetle was very common in September and did considerable damage by eating holes in pears and tomatoes. Although the beetles occur in sufficient numbers occasionally to do considerable damage, yet this visitation is but periodical. Recent observations at Washington show that this insect is injurious only in the adult state, and that the grub feeds on manure and humus.

The beetles hibernate, and eggs are laid in the early part of May, and the grubs mature in about two months. The pupa stage lasts about 16 days. The beetle is readily recognized by its triangular thorax, the yellowish-brown wing-covers mottled with black markings, and the grayish pubescence on the under surface of the body and on the legs and thorax.

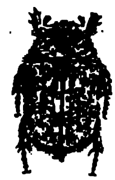

Fig 35.

The only practicable remedy is to collect these beetles.

Farm Insects.

The Hessian Fly (Cecidomyia destructor). The most serious insect pest of farm crops during the past season was the Hessian Fly, which destroyed the wheat crop in many sections. So far as we are acquainted with the conditions surrounding this pest, it is safe to say that the most available remedy is **Late Sowing.** Wheat sown as late as the last week in September has been found unaffected, while that sown before was affected. It is evident that farmers as a rule do not make any serious attempt to carry out the recommendations of practical entomologists in the matter of late sowing, trap crops, or uniformity in time of sowing.

The writer urges that this question, a most important one for the Province, be taken up by the Government, and extensive experiments be carried on in various sections to determine the most favorable conditions for sowing to avoid attack. These conditions have not yet been determined for Ontario.

Among the other serious insects infesting farm crops this past season were *Cutworms* which were abundant in root crops, and even in wheat fields (according to some correspondents). The more common species were the *Variegated Cutworm* (Peridroma saucia), the Spotted Cutworm (Noctua c-nigrum), and the Glassy Cutworm (Hadena devastatrix). The use of poisoned bran mashes has been found very beneficial in those cases where the remedy is practicable. A knowledge of the life history is often necessary to know the best time to sow grain to escape the cutworm.

The *Pea-weevil* and the *Pea-aphis* have made the growing of peas an uncertain crop in many localities. There is a practicable remedy for the weevil in the use of carbon bisulphide, or in the holding over of the seed peas for another season, when the weevils will have disappeared and the good seeds can be picked out. With regard to the Pea-aphis, should it become destructive it will be necessary for the pea grower to change his method of cultivation, and adopt drill planting, instead of planting broadcast as is done at the present time.

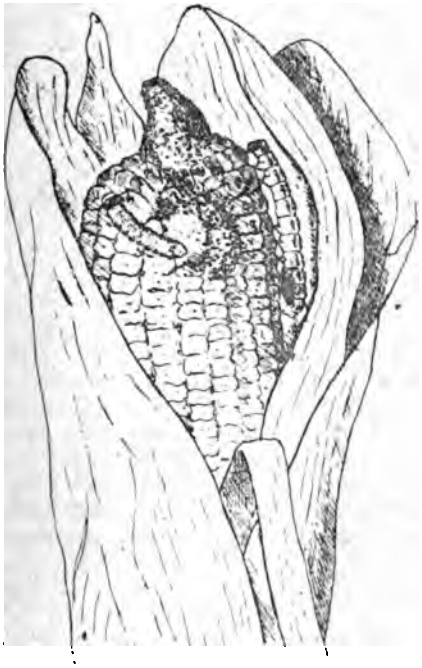

Fig. 36. An Ear of Corn affected by Corn-Worm; Caterpillars are very variable in their markings. (Original).

THE CORN WORM (Heliothis armiger). Fig. 36. This worm has been more numerous this season than usual, and appears to find Ontario conditions quite congenial. The green corn offered for sale in the Guelph market was frequently injured by the worm, and the Experimental Department of the College Farm found many ears badly injured at time of harvesting. The Trent Valley Canning Co. of Trenton reported on October 1st, that they had received a few loads of sweet corn containing many badly injured ears; and that in one locality from which they received corn the worm was very prevalent.

Observations point to the view that the Corn-worm is single brooded with us, but it may be double-brooded in some of the southern localities. Late fall-plowing will do much to break up the cells in which the pupae winter, thus causing the death of the pupae.

GRASSHOPPERS were abundant in late summer, not only in meadows and cultivated fields, but also in gardens where tomatoes, cabbage, celery, and other vegetables were often destroyed. Very likely the dryness of the season and the absence of frost were important factors which contributed to their abundance.

THE CABBAGE BUTTERFLY (Pieris rapae). This insect was more abundant than usual in cabbage and turnip fields, especially in the region lying to the east of Toronto. "Thousands of these winged insects could be seen flying over turnip fields." Although parasites are usually very abundant, it will not do to leave the work of extermination to them alone. A good practicable method of killing the cabbage-worms on small areas especially is to dust a mixture of one pound of insect powder and five pounds of flour through a cheese-cloth bag upon the infested plants.

NATURE STUDY LESSONS ON THE SQUASH BUG (ANASA TRISTIS).

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

INTRODUCTION. That a great awakening in the study of nature is in progress must be evident to every person who is watching the signs of the times. Both parents and teachers are demanding the introduction of nature-study into the daily course of the school, and scholars are becoming earnest nature seekers and observers.

The last Annual Report contained Nature-study Lessons on the Cabbage Butterfly, written in response to a desire for information about this common insect by several teachers who had been induced to introduce object lessons of such a nature into their schools. It appears that the lessons were helpful to many teachers, for frequent requests were made for the article during the past year. Believing that an information-article on some other common insect would be acceptable, the writer ventures again to outline a few lessons on the common Squash Bug of our cucumber and melon patches.

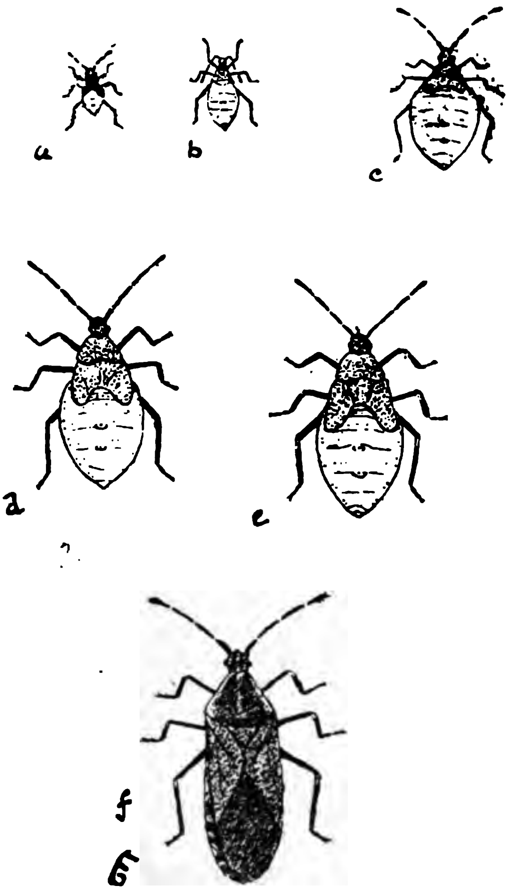

Fig. 37. The development of the Squash Bug. (*a*) The bug soon after it escapes from the egg; (*b*) the bug after the first moult; (*c*) the bug after the second moult; (*d*) the bug after the third moult; (*e*) the bug after the fourth moult; and (*f*) the adult bug after the fifth moult. (Original.)

Occurrence. Who has not seen the dull, smoky-brown insect or bug which hides under the wilted leaves of squash and cucumber in late summer? Or who has not thrown the bug down in disgust when the penetrating foul odour reached his nostrils? In the dead of winter one frequently comes across these bugs in crevices and corners of outbuildings and sheds, where they live in a torpid condition far into the warm weather of the next season. If outbuildings are not to be found the Squash Bugs hide under rubbish, bark and chips, which are usually present in carelessly kept gardens.

General Characters. When one can examine these bugs in spite of the offensiveness of the odour, many characteristic features will be revealed. The three pairs of legs, the two pairs of dark wings, a pair of feelers or antennæ, and the three divisions into head, thorax and abdomen (fig. 37, f) can be readily distinguished, and the thoughtful student will see at once that so far as the major characters are concerned the Squash Bug is similar to the Cabbage Butterfly. It is only when the minor characters, such as the texture of the wings, the shape of the mouth parts, and the size of the feelers and legs are considered that differences sufficient for classification purposes are seen.

Colour.—As to colour the adult winged squash bug is rusty-black, or smoky-brown above, and ochre-yellow below. If a magnifying glass be used it can be readily seen that the ground colour of the whole insect is ochre-yellow, and that the rusty-black colour above is produced by innumerable black dots which cover the legs as well as the wings and upper surface of the body.

It is interesting to notice the change in colour which the young bugs undergo as they pass through successive moults. When the bugs are young the under side of the abdomen is first greenish, then ashy-grey, and finally ochre-yellow. (Are the head and legs always of the same colour as the body?)

Head.—The study of the head of an insect is always instructive. The most prominent part of the head of a squash bug is the feelers or antennae, which are long, and divided into segments, the first and last being the stoutest. (Fig. 38.)

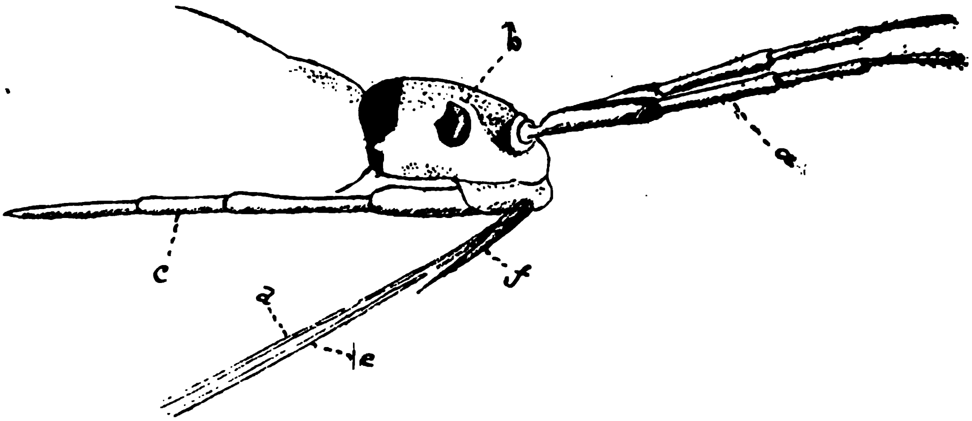

FIG. 38.—The head of the squash bug showing the antennae (a), the eyes (b), the 4-jointed beak (c), the four lances (d) and (e), and the labrum (f), (Original.)

The two large compound eyes situated behind the foot of the antennae are very similar to those of the cabbage butterfly, described and illustrated in last year's Report. In addition to the two compound eyes two simple eyes or ocelli may be seen with the aid of a magnifying glass between the large eyes. They look like minute glass beads.

If the under side of the head be examined a slender beak-like organ can be seen extending from the head backwards beyond the second pair of legs, (Figs 38 and 39), and a magnifying glass will show that this beak-like organ is a 4-jointed sheath, slit along one side. With the aid of a needle further information can be obtained by exposing the contents of the sheath. These are four fine lance-like structures which are apparently attached to a broader appendage near the head. (Fig. 38.)

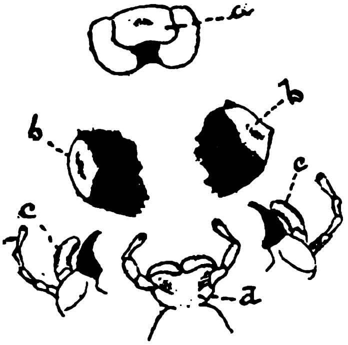

Fig. 40.—The mouth parts of the common locust dissected out, the upper lip or labrum, (a) the mandibles, (b) the maxillæ, (c) and the under lip or labium, (d) (Original.)

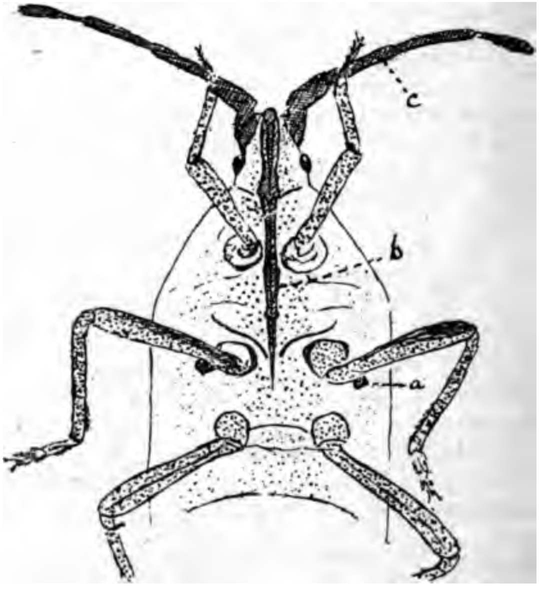

FIG 39.—The under surface of the squash bug showing the position of the two glands, (a) which secrete the foul odour, the beak (b), the antennae (c). (Original.)

The mouth-parts of the common locust are shown in figure 40, and it is evident that the different parts are adapted for biting and holding the object while biting. With the squash bug, however, the parts are not adapted for biting, but for sucking. The lower lip or labium forms the 4-jointed, grooved sheath, and the mandibles and maxillae form the four lance-like piercers, while the labrum is a scale-like flap to which, apparently, the piercers are attached. It will be observed that there are no palpi on either the maxillae or labium, but the parts have been modified for piercing and sucking.

The piercers penetrate the tissues of the leaf or stem, and by means of muscles at the base of the beak the fluids are drawn up. While the insect is puncturing the tissues with the piercers it drops in a little poison which causes the cells close by to wilt and die. Some observers consider the amount of damage done by the poison to be greater than that produced by the loss of sap.

ODOUR—The cause of the very disagreeable odour of squash bugs is a fluid which is secreted by two glands through two openings on the under surface of the body, situated close to the second pair of legs on the last segment of the thorax. (Fig. 39, a.)

WINGS.—The wings of the squash bug are characteristic of the large order of insects to which it belongs,—the HEMIPTERA, that is, the basal half of each of the outer pair of wings is thickened, while the outer half remains thin, membranous, and veiny. (Fig 41) The under pair of wings are thin and membranous, and are folded under the larger outer pair.

EGGS.—During July and even later the eggs are laid on the under side of the leaves in groups varying from 4 or 5 to 30 or 50. They are dull-red in colour, smooth and shining, about one twenty-fifth of an inch in length, and slightly flattened on two sides.

NYMPHS.—The young bugs escape from the eggs in about ten days, and proceed directly to abstract nourishing fluids from the stems. The nymphs may be found in all stages of development under wilted leaves during August and September. (Fig. 37). It will be observed that the nymphs are broader in proportion to their length than the adults are, and their head and first segment of the thorax are small. As the nymphs develop by moulting the wings become longer.

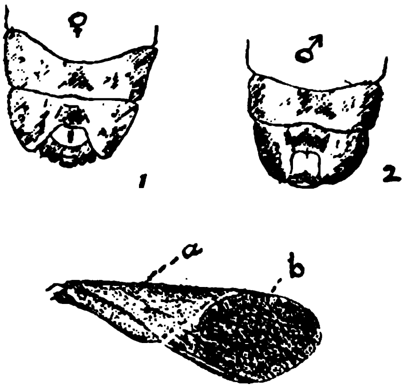

FIG. 41.—The outer wing of the Squash Bug showing the thickened inner half (a) and the membranous outer half (b). (Original.)
The last segments of the abdomen showing the differences between the female (1) and male (2).

REMEDIES.—From the fact that the squash bug does not eat its food, it may be inferred that Paris Green placed on the stems or leaves is of no use in killing the pest. Many substances have been tried, but most have been found unsatisfactory. Kerosene emulsion diluted with 9 parts of water and sprayed upon the vines has given fairly good results, but perhaps the best plan is to clean up the squash patches thoroughly in the fall; to place pieces of boards and chips during the summer among the vines to decoy the bugs, when they may be readily killed; and to pick the old bugs and eggs in early summer and destroy them.

TOPICS FOR OBSERVATION.

1. The month, and day of the month when the young squash bugs are first observed.
2. The location of the eggs on the leaf,—their number, colour and shape.
3. The hatching of the eggs,—the duration of the egg state, the way the young bugs escape from the eggs.
4. The moulting of the nymphs,—the number of moults, the changes with each successive moult, and the duration of each stage.
5. The offensive odour,—the position of the secreting glands, the use of the fluid to the insect.
6. The best methods of controlling the insect in melon patches.
7. Males and females,—distinction and relative numbers. (Fig. 41, 1, 2).
8. The development of the wing.
9. Parasites.
10. Other insect enemies of the melon patch.
11. Mode of feeding,—the way the fluids are drawn up.

THE BREEDING OF LEPIDOPTERA, WITH NOTES ON THE INFLATION OF LARVÆ.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

The value attached to the breeding of insects cannot be over-estimated. The facts concerning the life-histories of species, resulting from careful work in rearing specimens, are of the greatest importance, and any person having a taste for this branch of study has many opportunities of doing excellent work. There is so much yet to be done in studying out the life-histories of insects, and so few people who care to take the time or trouble to do careful work, that those who are disposed have a field in which employment of a useful nature can be found. In the Order Lepidoptera alone there are hundreds of species which have never been properly worked out, and information of an authentic nature in regard to such is much desired. Facts concerning certain stages or habits of even some of our commonest butterflies and moths are badly wanted.

In breeding Lepidoptera from the egg to the imago, there is much of interest to observe. Some of the stages are intensely interesting, as everyone who has attempted breeding with any degree of success knows. The true object of breeding insects is not to get perfect specimens of the imago, but to study their earlier stages, taking careful notes of observations made, and giving the result of information thus obtained to others, through the medium of entomological publications. It cannot be said that such work is hard, but at the same time great care and accuracy are required, without mentioning the need of a good stock of patience.

To meet with the best results, two very important points must be borne in mind, and these are to see that the jars are kept thoroughly cleaned, and that sufficient, but not too much, of fresh food-plant is always present. The larvæ of butterflies, especially, require extra care and attention to see that the breeding-jars are always clean, and that the food-plant is kept fresh. Carelessness in this respect oftentimes causes failure. Breeding-jars should be washed out at least every day, if the best results are desired, even twice a day is not too often for delicate larvæ. It is also often best to change the food plant twice a day.

In studying the earlier stages in the life-history of a butterfly or moth, as soon as the eggs hatch, it is well to put one of the larvæ in a small jar, keeping it separate from the others, so as to watch it carefully through its different moults. Two could be kept in the same jar, but instead of this it is better to have two small jars, one for each caterpillar. These should be kept beside the remainder of the brood, if any, so that they may also be watched, as many vary in the same stage. It is important that careful descriptions of the egg, the larva (in all its stages), the chrysalis, or pupa, and cocoon, if there is one, should be made, noting in fact everything of importance bearing upon the life-history of the species.

For the most part ordinary jelly jars with tin lids will answer for breeding lepidoptera; those with the rounded bottoms are preferable, as they do away with the chance of moisture gathering in the corners. Two or three different sized jars are more convenient than having them all the same. Of course if a large number of the same larvae are being reared bigger jars or breeding cages, will be found necessary. Some writers recommend tin boxes of various sizes. These also are excellent receptacles, and it is claimed that it is not necessary, when breeding sphingids, to put earth in the tin as the larvæ will readily pupate on the bottom of the box.

Careful watch must be made for the moults of the larvæ. Before moulting the caterpillar, as a rule, stops feeding for a day or so, during which time the front segments become swollen, so much so that they appear larger than the head, which with the cast skin, soon afterwards, usually during the following or the next day, is thrown off. As soon as the larva has moulted, a careful description should be taken, noting its length, shape, colour and arrangement of markings, size and shape of head, etc., etc. The cast skin and head should be preserved in a small bottle, or box, with careful data. The empty cocoon, pupa, or chrysalis, should also be preserved, as well as the egg shells.

A method by which the eggs of many moths may be secured is to capture a female, enclosing her alive in a small box for a day or so, and if she has not already laid eggs, it is probable that she will do so in confinement. All females, however, will not lay eggs in confinement; from some it is exceedingly difficult to obtain ova. Eggs from butterflies especially are hard to procure, and extra inducements have sometimes to be offered. A good plan is to feed the female with a sweetened fluid, such as honey diluted in water. This can be accomplished by touching the tongue with a fine camel's hair brush which has been dipped in the fluid. Another method to secure eggs is to imprison the female in a bag made of muslin, or some such material, placed over the plant upon which the larvæ feed. In the case of larvæ which feed on low plants such as grasses, etc., if a small plant is transferred to a flower-pot, a covering of muslin, with the aid of two pieces of wire bent into a hoop, can be placed over the plant and the living female enclosed. It is best to have a portion of the plant touching the muslin at the top, as many species will leave the plant and deposit some, if not all, of their eggs on the muslin. If eggs can be secured through a friend living at a distance, they will travel safely through the mail. The present summer several batches of eggs were received at Ottawa from points in the Rocky Mountains, Northwest Territories and other distant localities.

If a number of specimens of the same species are being bred it is nice to have a specimen or two of each larval stage inflated, as it is important that as much of the life history as possible be preserved for the cabinet. If the first stages are too small to inflate, they can of course be preserved in alcohol, or some other fluid, or they may be dried on hot sand with some success. There are various methods of inflating larvæ, and some experience is needed before satisfactory results will be attained. Hairy caterpillars especially are difficult to inflate, but experience will teach the beginner that great care and much patience are required in order to do good work.

For inflating larvæ very few appliances are necessary, and these are not at all expensive. They can easily be had from most of the dealers in entomological supplies.

When the larva has reached the stage at which it is to be preserved the first thing to do, of course, is to kill it, and this can be done by dropping it for a minute or two into a receptacle containing methylated spirits. When the caterpillar is dead it can be taken out of the liquid with a small pair of forceps, and placed on its side on a piece of blotting paper. When this is done take a small piece of the same paper in the left hand placing it over the larva, gently pressing the front segments, with exception of head. A small sharp pointed instrument should then be inserted into the anal orifice, so as to admit of some of the liquid contents coming out. For all except minute larvae a large needle, or a pair of small forceps with curved points, may be used for this purpose. Further pressure will now be necessary in order that the remaining contents may be squeezed out. Just sufficient pressure should be applied to remove the contents; if too much is given the skin will be bruised.

When the viscera have all been removed, insert the necessary-sized glass inflating-tube into the anal orifice. The larger of these tubes have clips or spring attachments to hold the larval skin. If the caterpillar be small it can be fastened to a smaller tube by means of a thread of fine silk wound around the posterior segment. The inflating-tube can now be inserted into the rubber tube of the double bulb inflator and the empty skin gently inflated. If everything is all right it can then be placed in the oven and slowly dried. A suitable oven can be made by any tinsmith, and is simply a tin box about 6 inches long by 4 inches wide and 2½ inches deep, supported on legs to allow of the lamp being placed beneath it, and having an opening in one end to insert the larva, with another at the bottom for the circulation of air or to allow the escape of some of the heat. A sheet of glass let into the top enables the operator to see what he is doing. The drying process should be carried on over the hottest place, commencing with the front segments and working backwards. Care must be taken not to hold the same portion of the larval skin too long over the heat, but the segments that are being dried should be kept turned, so that all sides may be dried about the same time. While this is going on too much air must not be pumped into the skin; if this is done it will stretch the larva and give it an unnatural appearance.

Any small spirit lamp will do to supply the heat, which must be regulated according to the nature of the species being inflated. Too great a heat will destroy the colors of many larvæ, and this is especially so in the case of delicate green caterpillars. Hairy larvæ, as already mentioned, are rather difficult to blow, as the hairs are very easily rubbed off, and unless care is taken in the inflating the segments will be sure to expand too much and thus be puffed out unnaturally. When the skin is ready for the oven a pair of forceps will be found a means of help in inserting the inflating-tube into the vent.

After the larval skin is thoroughly dried care should be taken in removing it from the inflating-tube. This can easily be done in most cases by simply forcing the skin off the tube by means of the thumb-nail of the right hand. The caterpillars may then be mounted on a piece of fine wire wound tightly around the pin five or six times, the lower end of the wire being neatly cut off. The portion on which the larva is to be mounted may be cut according to the size of the caterpillar. Any good cement, such as that used for repairing insects, may be employed to fasten the blown skin to the wire.

NOTES ON TWO LONGICORN BEETLES AFFECTING GROWING NURSERY STOCK.

By F. M. Webster, Wooster, O.

With the rapid changes in the flora of the country, brought about by advance in our civilization, there must of necessity come changes in the habits of such of the animal life as is dependent upon this flora for their food supply. Nor do the influences stop here, for it is frequently not difficult to observe the effects of such changes even in the parasitic enemies of these animals.

Hardly a season passes but that some old and well known insect exhibits some characteristic not before observed. Sometimes this, to us, new phase of its sociology may not again be noticed for years, or it may continue and indeed increase to such an extent as to become a normal characteristic of the species. As instances of this change of habit, the adult of the Western Corn Root Worm, *Diabrotica longicornis*, was formerly known only as a green beetle found on the blossoms of thistle and golden-rod; whereas, now, it swarms over the corn fields of the middle West in myriads, and the larvæ are one of the worst pests of the corn field. It is only within the last three years that the two ground beetles, *Harpalus caliginosus*, and *H. pennsylvanicus*, have come into prominence as strawberry insects.

The first species here considered is the coated Saperda, or the Linden borer, *Saperda vestita*, Say (Fig. 42) described in 1824, from specimens taken near the southern extremity of Lake Michigan, but was also known at that time to occur in Pennsylvania. Though common, the insect does not appear to have anywhere become seriously destructive though it was well known to Harris as early as 1832 and said by him to have been destructive to the European Linden in Cambridge, Massachusetts, in 1843 and 1844.

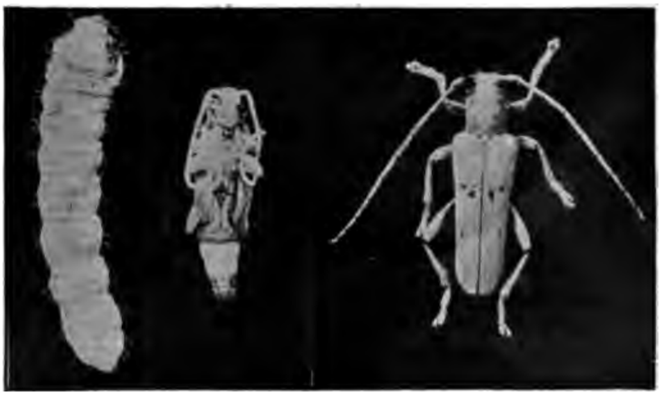

Fig. 42.—*Saperda vestita* Say; 1, larva; 2, pupa; 3, adult; all slightly enlarged.

Dr. Paul Smith, in a letter written May, 1844, quoted by Dr. Harris in his "Insects Injurious to Vegetation" gave an account of an attack upon European Linden trees in Washington and Independence Squares, Philadelphia. The trees were attacked about seven years before but within two years it had been found necessary to cut down forty-seven of these European Lindens in Washington Square alone. The American Lindens were also injured but apparently to a less degree. One of the Lindens mentioned by Dr. Harris was very large, the trunk measuring 8 feet, 5 inches in circumference 5 feet from the ground. A strip of bark two feet wide at the bottom, and extending to the top of the trunk, was destroyed, and the exposed surface of the wood was pierced and grooved with countless numbers of holes where the borers had been bred, and whence swarms of these beetles were supposed to have issued in past times. Some of the larger limbs and a portion of the top of the tree fell down, apparently in consequence of the ravages of these insects.

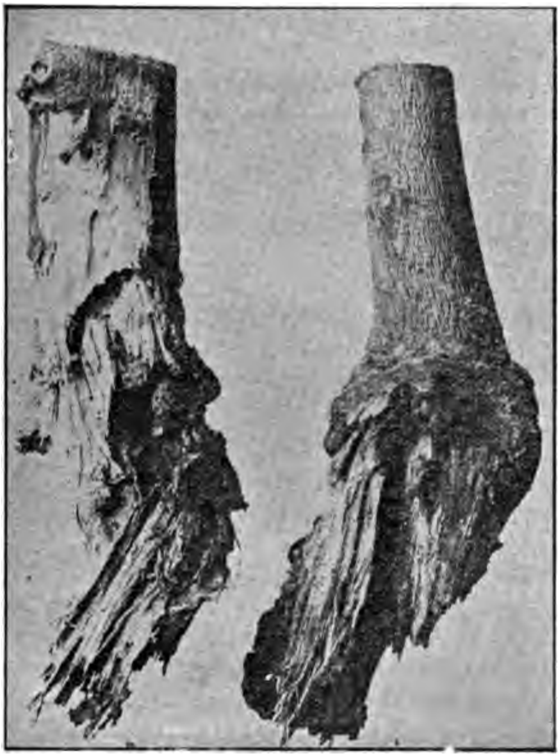
Fig. 43.—Bases of affected trees, about natural size. Original, after photographs by P. A. Hinman.

In the American Entomologist, New Series, Volume I, page 271, Dr. C. V. Riley cites the species as very injurious to the European Linden in Cambridge, Massachusetts, and Philadelphia, Pennsylvania, quoting Harris as authority, and also adds "boring at the base of young European Lindens and gouging two parallel rings around the trunk which form annular swellings." Thus it will be seen that the insect exhibits a partiality for the European Linden, but its injuries during later years do not appear to have attracted the attention of entomologists to any large degree. Last year, my former assistant, Mr. Mally, while inspecting nurseries, found a number of small Linden trees in the nursery row that had been very seriously injured by larvæ burrowing in the trunks below ground. Mr. Mally, from the appearance of these larvæ, thought they might be those of the Round-headed Apple Tree borer, *Saperda candida*, the adult of which is shown in Figure 44. These young trees growing in the nursery row were cut and transplanted to the insectary on the 28th of August. On the 15th of January, 1900, examination of these trees (Fig. 43) revealed one larva still active in the rotten wood, and about four inches below the surface of the ground. On April 4th one adult *Saperda vestita* emerged. It must be remembered that this was under insectary conditions. The next day the entire lot of material was examined. One additional larva (No. 1.) and a pupa (No. 2.) were found. These larvæ had worked in the wood at the root, entirely below the surface of the ground, and, in fact, the upper limit of their burrowing was from two to four inches below the ground. When ready to pupate the larvæ evidently burrow their way upward in the wood to the level of the ground surface, or within an inch or two of it. They pupated in cells cut

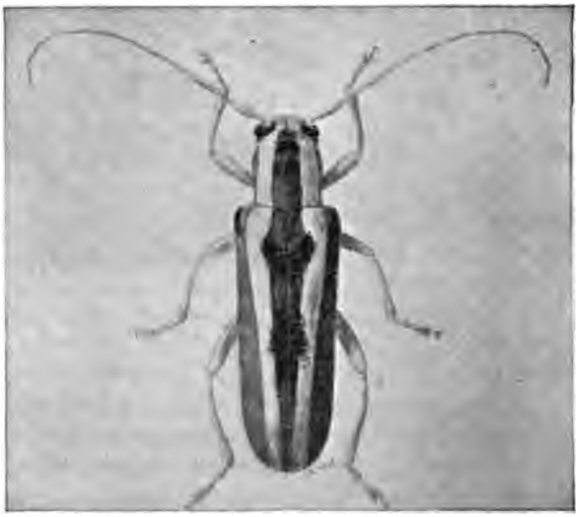
Fig. 44.—*Saperda candida* Say.

diagonally across the grain of the wood at an angle of about 45 degrees to the upward channel.

So far as known to me this is the first instance of this insect having been observed attacking nursery trees, and also the first record of their working below the ground. All previous records represent them as working above the surface, their attacks being confined to the trunk and larger branches.

Dr. Harris states that the adult *Saperda vestita*, after having emerged from the trunk and larger branches of the trees, will fly into the top and there feed upon the epidermis of the tender twigs and the petioles of the leaves, often wholly denuding the latter and causing the leaves to fall. It may not be out of place to state that a few years ago a specimen of *Saperda candida* (Fig. 44) was sent me, accused of gnawing into the young growing apples, and specimens of these that accompanied the insect gave abundant evidence of the truth of the statement.

The species under consideration is said to deposit their eggs, two or three in a place, upon the trunk and branches, especially about the forks, making slight incisions and punctures for their reception, with their strong jaws. As many as 90 eggs have been taken from a single beetle. The larvæ, hatching from these eggs, undermine the bark to the extent of six or eight inches, often penetrating the wood an equal distance.

This appears to be an instance of an old and well known species taking on a new habit, as I can find nothing on record of their having ever been before observed depredating in the nursery row, and there is certainly nothing on record relative to the larvæ working below the surface of the ground.

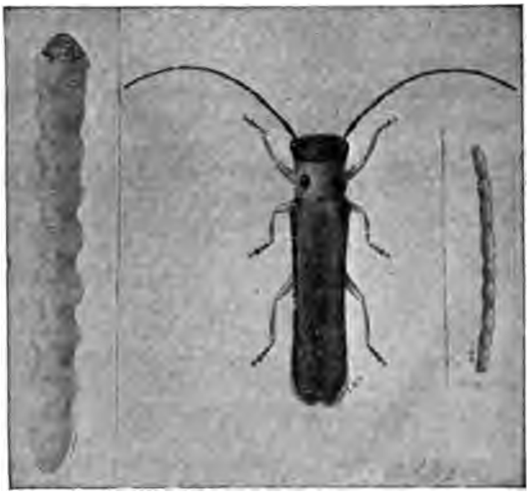

Fig. 45.—*Oberea bimaculata* var. *tripunctata* Sw. Larva enlarged at left; Section of excreta at right, all enlarged.

The second species, with which this paper has to deal is *Oberea bimaculata*. While this is, perhaps, more of a small fruit than a nursery pest, nevertheless, we have come in contact with it in our nursery inspection, although not especially as affecting nursery stock. In Bulletin 96 of the Ohio Agricultural Experiment Station, pages 20-22, I gave an account of this insect and stated that we had reared it from witch hazel *Hamamelis virginiana*, also from apple twigs. The specimen is shown in Figure 40. A further study of this insect has shown that it is *Oberea tripunctata*. Specialists make this a variety of *bimaculata*. Since this work was done, I have twice reared the true *Oberea bimaculata* from raspberry, which it is known to infest. There seems now to be a dividing line between these two forms, *tripunctata* having a variety of food plants, while *bimaculata* appears to confine itself to canes of *Rubus*. The object in presenting this matter is to correct a possible error in Bulletin 96, in terming the species there reared from witch hazel and apple twigs, *Oberea bimaculata*, without further qualifications. Although as stated, the two are considered to be the same species by systematists the rearings at the Station imply that there is a sharp distinction between the two in the matter of food habits, and it seems to me that this would be very strong evidence at any rate, that may, some day, be used in separating the two insects. Any one wishing to follow up our studies of these species will find them recorded in Bulletin 96, of the Ohio Agricultural Experiment Station, pages 20 22, and the Journal of the New York Entomological Society, Volume V, pages 203 204, with illustrations, and Volume XI, pages 437-438 of Entomological News. It will be a very interesting study, and one fraught with some economic importance, to carry on a large number of rearings, both from *Rubus* and other plants. If this food distinction between the two forms holds good throughout, *Oberea tripunctata*, Swederus will be entitled to rank as a species.

A very valuable contribution to our literature upon these insects will be found in Bulletin 23, Agricultural Experiment Station, Cornell University, pages 120-24, by Professor Slingerland. The two forms are so exceedingly alike in appearance that none but expert entomologists have been able to separate them. As relating to this matter Mr. F. H. Chittenden, Assistant Entomologist in the Department of Agriculture, wrote me Feb. 8th, 1899, also stating that he had been unable to avoid the impression that the two insects were distinct, notwithstanding the opinion of specialists to the contrary. I speak of this more in the way of a suggestion, as it seemed to me a problem which a careful entomological student may well take up and solve.

HABITS OF THE LARVÆ OF DERMESTES TALPINUS (MANN.)

By Percy B. Gregson, Waghorn, Alberta.

To fur trappers in the far North West the larva of this beetle, which Dr. Fletcher has kindly identified for me, is but too well known. (Fig. 46.) It seems to be ubiquitous and almost omnivorous. Hitherto, however, it has been understood to feed only on dead things, such as fur hide, skin, bacon, wool, dead insects, etc., but in rearing it, as I have in considerable numbers, I have noticed features which show the larva in its very early infancy to be endowed with a very extraordinary activity, or to be a parasite of living insects. These features I should like now to record.

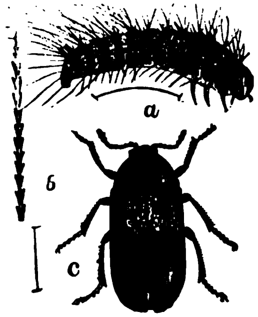

Fig. 46 represents the beetle and larva (magnified) of *Dermestes lardarius* — a most familiar species.

My practice when spreading lepidoptera is to place the setting-boards within a box with closely-fitting door, but the frequent destruction of the insect by the Talpinus larva, before the insect itself had become sufficiently set for removing, determined me to investigate the early existence of the larva. I noticed that the butterflies I caught in May and early June (*Colias occidentalis, E. discoidalis,* etc.) were peculiarly liable to attacks by this pest. Others caught later in the year were free from them. When I discovered the larva on the setting boards (generally on the second or third day after setting the insect) the largest of the larvæ did not exceed one line in length, and from the dust-like frass under the body of the butterfly and the excavation made in the body, the larva had evidently been at work for some time. It being easily possible for such minute creatures to have crept through some small crack into the interior of the box, I decided this year (1900) to rear a few, as soon as I could get any, in a tightly closed tin tobacco box three inches deep, for I found they could not crawl up the tin sides of such a box. They cannot crawl up tin at any slope greater than 30 degrees. Placed on the higher part of such a slope, they slide down to the bottom.

On the 12th of May, 1900, I found a *D. talpinus* larva on a hybernated specimen of *Vanessa cardui* which I had captured and spread on the 10th. This little larva (not a line in length) I at once placed in the empty tin tobacco box, with the carcase of the *V. cardui*, and closed the lid and saw that there was no space for ingress of even the minutest insect, assuming that it first could scale the tin sides of the box. Being much occupied for the next few days, I simply added a Colias or two (caught in the manner I shall presently describe) without disturbing the little grub which was within the carcase of the *V. cardui*. On the 25th May I introduced to him a *Colias occidentalis* caught that morning. I always carry with me when hunting near home for lepidoptera, a shallow (½ inch deep) tin cigarette box whose lid fits very tightly, requiring an effort in fact to open, and into this box I at once place, direct from the net, my captured specimens, folding them in papers on the spot (first, however, killing the Colias, Erebias and such sized insects by pressure on the thorax in the net) and it is therefore impossible for any foreign insect to gain access to the interior. I followed this course on the 25th May, and the *C. occidentalis* I introduced to the Talpinus larva I took direct from its paper in the shallow box, as I did all the insects with which I fed my Talpinus, and dropped it into the larger tin box. On exploring the interior of this box in the evening of the 25th I found a second Marmoratus larva (very minute) feeding on the body of the newly introduced Colias.

On 28th May I introduced another *C. occidentalis*, caught under and treated in precisely similar fashion to the others above mentioned, and soon afterwards observed a third little Talpinus larva on the bottom of the tin box. There were now three of these larvæ, and for the first time I introduced to them a small piece of coyoté fur. This, however, was not touched until the carcases still remaining had been devoured, and there was no further increase in the family. On the 4th June, however, I placed two more fresh *C. occidentalis* in the box (both caught as before) and as I had now become accustomed to mysterious additions to the family I presently observed without surprise a minute Talpinus crawling from just under the right wing of the last introduced butterfly. Here then were four larvæ, all of which had been obtained through freshly captured butterflies, and none of which could have possibly crawled into the deep, close-lidded tin box, nor can I imagine that they could by any possibility have gained admission to the shallow tin collecting box and to the folded papers within, unless they were already on the bodies of the butterflies when captured. In which case their activity seems little short of marvellous.

Although on subsequently ceasing to feed the larvæ with butterflies they ate the fur hide, they nevertheless deserted it again for bodies of insects when I once more introduced that kind of food. I have even found one in the dead body of a common house fly.

In closing these few remarks I may add that I procured a dozen of these larvæ from butterflies in the above described fashion this year. The first to pupate did so on 7th July and hatched on 9th August.

OBSERVATIONS ON SEVERAL SPECIES OF DERMESTIDÆ.

By F. M. Webster, Wooster, O.

The necrophagous habits of many of the species of this family of insects are well known, but it is doubtful if the phytophagous habits are very much less emphasized in other species.

Byturus unicolor Say, is, perhaps, best known as the Raspberry Fruit beetle, and I have observed it feeding, usually in pairs, on the blossoms of *Geum*, either *rivale* L, or *album* Gmel. *Byturus tomentosus* Fab., is destructive to the Raspberry in England.

The common introduced species, *Dermestes lardarius* Linn., while affecting dried skins, meats, etc., is also fond of bread and other grain products, and has twice been reported as destroying honey comb. *D. vulpinus* Fab., has been reported as damaging tobacco.

Perimegatoma cylindricum Kirby, var. *angulare*, has been reported as a possible enemy of the Fluted scale, *Icerya purchasi* Maskell.

Attagenus piceus Oliv., has become so destructive to woolen fabrics and carpets as to receive the name of Pitchy or Black Carpet-beetle. It has been sent to me from Indiana breeding in beet seeds, larvæ, pupæ, and adults all being present in the seeds when received.

Trogoderma ornatum Say, though beyond a doubt a museum pest, is a vegetable feeder as well. From the seed of the garden sunflower, collected May 28, 1899, this beetle emerged, in the insectary, June 17, 1900. From seeds of *Ambrosia trifida*, collected October 10, 1899, a specimen emerged in the insectary, May 19, 1900. From seed cluster of *Euthemia graminifolia*, collected October 12, 1899, beetles emerged in the insectary, March 31, 1900. These seeds were infested by unknown larvæ when collected.

Anthrenus scrophulariæ Linn, so well known as a carpet beetle, I have, for years, ound in abundance during early spring, in the blossoms of the Tulip, and almost invariably in those of a pure white color, or nearly so. I fully believe that this is more of an out of door insect in this country than we at present suppose, though we know that, at home in Europe from whence we received it, the insect is unknown as a household pest.

Anthrenus varius Fab., I have taken in the blossoms of Tulip, in connection with the preceding, and also by itself in the Peony blossoms in June. A single individual was found in a breeding cage, supposed to be secure against the ingress as well as the egress of the smallest insects, in which were thorns of the Honey Locust, infested with lepidopterous larvæ. Of course, in this case, the beetle might have made its way into the cage, though the probabilities are that it did not. I have reared either this species or *A. musæorum* Linn., from masses of spiders' nests mingled with the bodies of dead insects, as well as the living, in hibernation, under the loose bark of a hickory tree.

NOTES ON DANAIS ARCHIPPUS.

By C. W. Nash, Toronto.

During the past season (1900) I have made the following notes of the movements of this butterfly in the neighbourhood of Toronto:

June 14th.—Saw first Archippus butterflies. There were three of them loitering over the willow bushes near the shore of Lake Ontario. They were much faded and ragged; all of them were flying eastward.

June 20th.—Archippus butterflies are now common. All are very dull coloured; their scales being worn off and wings ragged, they look old.

July 21st.—I examined a large number of Asclepias for Archippus larvæ, but found only one, about half-grown. The butterflies are common, but all seen are dull and worn.

July 22nd.—On a small patch of Asclepias, near my house, I found a number of Archippus larvæ of various sizes, some very small and ranging up to full-grown ones; also found several chrysalids.

I watched several of these chrysalids for some time, but not one of those I kept under observation produced a living butterfly. In each case the insect reached the perfect stage, or nearly so, and then died in the shell. None of these appeared to be parasitized; they simply dried up.

August 5th.—Archippus butterflies are now congregating about the trees near my house, where they roost; some of the flocks contain over one hundred. These are all large, bright coloured specimens, evidently produced this season.

September 4th.—Archippus butterflies were streaming along the lake shore in myriads all this afternoon I travelled through the flock for about five miles, and in that distance there was no break in the flight; all of them were flying westward. At times individuals would alight on the ground, always with their heads pointing westward. They seemed generally to select a shady spot to alight on, and in some places the ground was covered with them. After resting a few minutes they would get up again and go on with the flying crowds. The wind was from the north-west, very light, in fact scarcely perceptible.

Just at sunset I visited the trees they frequent near my house and found a great many roosting there.

September 6th.—Very few Archippus butterflies about to-day.

September 7th.—Only saw a few individuals.

September 28th.—Saw a few Archippus butterflies to-day, perhaps half a dozen.

October 6th.—A few Archippus still about.

Prof. Comstock and some other entomologists say that no birds will eat the D. Archippus. This is a mistake, so far as the butterfly is concerned, for I have myself taken them from the stomach of cuckoos. So far I have not identified the larvæ in the stomach of any bird, and it may be that they are never eaten by them.

[At London, Ontario, this year the Archippus butterfly was seen as late as November 2nd. A specimen captured on the 27th of October lived for over a fortnight in the Society's room and died apparently from a chill, as it had been left on the windowsill one cold night.]

THE PRESENT STATUS OF THE SAN JOSÉ SCALE IN ONTARIO.

By Prof. Wm. Lochhead, Guelph.

It will be remembered that the Government relaxed its strong policy of extermination in May of 1899, owing to the great opposition which was encountered. Nothing was done by the owners of the infested orchards to prevent the spread of the scale until the spring of the present year, 1900, when the Government came to their help and offered to provide whale-oil soap and crude petroleum at half price. While many orchard men took advantage of the liberal offer, it is yet a regrettable fact that many failed to buy soap or crude petroleum, or to use any other remedy. Inspection of the treated orchards, moreover, reveals the fact that the spraying was often done carelessly, or too little of the soap was used per tree. As a result of such careless treatment the scale is even more abundant at the close of this season than it was at the close of last season and the infested trees are more plainly detected. It may be said with a great deal of truth that in the infested areas of Guilds and Niagara no orchard is free from scale, and orchards which had not more than ten per cent. of the trees marked for scale last year have now scale on nearly every tree. While careless treatment has done so little to check the spread of the scale, yet some good results have been secured by careful spraying with good whale-oil soap and crude petroleum. Where whole blocks were treated carefully the intensity as well as the spread has been checked appreciably, and some of the best fruit was picked from trees which had been marked for one or two years.

In the Niagara and St. Catharines districts the owners are, as a rule, indifferent, and the impression seems to have spread that the scale is not any worse, if as bad, than some other evils against which the fruit-grower has to contend, and which are infesting orchards, such as *Yellows*, *Rose-Leaf*, small peaches, *Blight*, etc. A cursory inspection fails to show many apple trees which have given way, but many dead limbs can be found, as well as many dead peach trees.

In the Guilds district, Kent county, the scale has gained great headway and moderately infested orchards of last spring are now badly infested, for no spraying was done to check the progress of the pest. There, however, the owners are beginning to realize the necessity for action, and several have already purchased spray pumps and are preparing to combat the scale with vigor this coming winter and early spring. Time is evidently required to educate the fruit growers to give their orchards proper care.

It is difficult to state with any degree of certainty the extent of spread of the scale to new districts since the work of inspection of orchards was discontinued. Two new locations, however, have been discovered accidentally—one noted in London East by Mr. J. Dearness, and another at Essex Centre by the writer. The latter case was a very severe one, and it is probable that the scale has spread a considerable distance from this new centre.

Opinions differ as to the relative merits of good whale-oil soap, and crude petroleum. Some consider the latter a too dangerous remedy to be applied by careless sprayers, and prefer to continue the whale-oil soap treatment. Others, again, maintain that crude petroleum has given better results, both in controlling the scale, and in invigorating the trees. As a result of the experiments this year some valuable points have been gained. The whale-oil soap must be of a certain standard of quality to give results at all effective, and in the application of the crude petroleum good results depend on the method of spraying—i.e, in the handling of the nozzle, rather than on the percentage of oil, as Mr. G. E. Fisher has already explained to this meeting.

A PARASITE OF THE SAN JOSÉ SCALE.

By John Dearness, London.

Last year I received a packet of twigs bearing scale insects, mostly San José, from Mr. John Gordon, Guilds P.O., Kent Co., on some of which there were parasitic mites preying at least on the well-grown females of the species of scale insect named. On some specimens received this year from the same neighborhood these mites were very numerous. I mounted some specimens and with a female S. J. put them in the Society's collection of microscopic slides. As many as eighteen larval mites were observed under one large scale.

Mr. N. Banks, Washington, a well-know expert on mites, reports it *Tyroglyphus malus*, Skinner, which is known to prey on the larvæ of the oyster-shell bark louse. Dr. Howard writes that J. Lignières published a valuable article on this mite in the proceedings of the Societé Zoologique de France in 1893. The habits of the mite are given accompanied by excellent anatomical figures.

"The San José scale is spreading very fast this year" in Ontario. This statement was made again and again last season, and it is repeated this year. Some people who have heard it, have inferred that since the suspension of the cutting and burning of affected trees the insect has multiplied at a more rapid rate than formerly. The discovery of new areas and new locations of infestation does not prove that the scale has increased abnormally last year and this one. That the pest was not in these newly discovered infestations in 1898 or in previous years is only an assumption; to say that the township or even the orchard was inspected in that year does not by any means prove that the scale was not there.

The officers' assurance in 1899 that the scale was well-nigh "surrounded" was based on the belief that by tracing the deliveries of stock from the few infested nurseries all initial points of its distribution could be located. The possibility, nay the probability, of a more general introduction may be reasonably suspected from a consideration of the methods adopted by some nursery agencies. For several years past, as a county school inspector, I have received one or more circular letters asking for a list of the addresses of the teachers in the county, the reward usually offered for the trouble was one or more young trees or flowering shrubs. The teachers whose addresses were thus obtained were urged to do some canvassing in their respective neighborhoods, or, in some cases, to send a list of orchard owners or probable purchasers in consideration of a like reward to that just mentioned. The badly infested New Jersey nurseries were as likely as any others to supply stock to the jobbers who sought to use the teachers as distributers of it.

In addition to the stock imported and scattered all over the country by jobbers there is no doubt that individual farmers here and there imported young trees direct from the nurseries. Dealers would not put and keep their advertisements in the papers without seeing some benefit from them. These are some of the facts to be considered before accepting the conclusion that all or nearly all the centres of infestation in Ontario were known in 1899 and that new ones are due to the interruption of the methods in operation in the spring of that year. Incalculable good came from the tracing and destroying of affected nursery stock. Upwards of a hundred centres of evil were thus probably rendered harmless. All that the San José scale has cost Ontario has been doubly and trebly repaid by this action alone. On the other hand harm came from the sense of false security begotten of reliance on the reports of immunity based on a superficial examination of the orchards in the fruit growing townships.

The hope for the future successful disposal of the scale-insect difficulty lies not in legislative intervention but in education. Every farmers' institute and every school-house should be a point from which light should be thrown on the nature, life-history and method of treatment of our insect and fungal pests. Lessons on the scale insects could be made as useful and made to yield as good training for the observing and reasoning powers as an equal number of lessons in spelling, algebra, arithmetic, etc.

In August Rev. Mr. Seaborne discovered an infestation of San José scale in London East. In September Mr. Ellwood of St. Thomas sprayed the trees with a very dilute solution of coal-oil to which some common salt was added. He claims that the salt makes the solution more effective against the insect without correspondingly endangering the vitality of the tree. I visited the place twice since Mr. Ellwood's treatment. The leaves of the sprayed trees were injured more or less, but I found no living scale. On one branch I took away there were two females found which did not appear to be dead. On a branch taken subsequently no living scale insects were found. The developments of next spring will tell whether the treatment is effective.

THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.*

The twelfth annual meeting of this society, which was founded in Toronto in 1889, was held at Columbia College, New York, on the 22nd and 23rd of June, 1900. In the absence of the President, Prof. Bruner, the chair was taken by the Vice-President, Prof. C. P. Gillette, who read an address on "the objects of the Association of Economic Entomologists." The first of these is "to discuss new discoveries." This implies, the speaker said, that new discoveries are to be made. It takes for granted that the members are to be scientific workers and not mere book students, content to thrash over old straw or to step exactly in the footprints of another. After referring briefly to Dr. Riley's "introduction of the Vedalia to the relief of disheartened fruit growers" in California, and to Dr. Howard's having made possible the successful culture of the fig through the establishment of *Blastophaga grossorum*, he stated that it would be difficult to find so small a body of workers, with so meagre an amount of time to be devoted to original research, in any other science who can show larger results in the way of new discoveries in so short a time.

A further object is "to exchange experiences and to carefully consider best methods of work. No one can be a toiler in any special line for a year without encountering experiences that might be related to a fellow-laborer to his profit. We are scattered over a large territory, having widely varying conditions of climate, altitude, and plant and insect life. Each can bring from his particular field some points of peculiar interest to all the others. While we may read one another's publications and perhaps exchange frequent letters until we almost feel acquainted, it is only occasionally that we can enjoy these meetings together, and it is a great inspiration to talk freely over one's experiences and plans of work face to face with those who are interested with him in similar lines of labor."

"The student of applied entomology is supposed to have a good general knowledge of agricultural affairs, particularly in regard to plant growth. He must be informed upon all the insecticide materials and be able to tell what insects they are suited to kill, in what strength they may be applied to different plants, what their physiological effects will be on both plant and insect life, and when they can best be applied. He is supposed to be able to tell at a glance what any insect is that may be handed him, and whether or not it is injurious or beneficial. He is expected to be able to recommend the cheapest and best pumps or other machinery for the application of insecticides. Is it any wonder that we need to get together and exchange experiences and discuss methods of work, particularly when we remember that different results are obtained in different localities? Lime, salt and sulphur, so valuable for the destruction of San Jose scale on the Pacific coast, were found to be of very little value in the moist atmosphere of the eastern portion of the country; the codling moth, said to have one brood in Maine, is reported to have two in Colorado, and three or four in other places; insects fairly common but never seriously abundant in one portion of the country are often found to be great pests in others. In view of these conditions it is important that we obtain all the ideas possible from fellow-laborers in different localities, that we may make as few mistakes as possible, and that we may not bring down upon ourselves the distrust of those whom we labor to benefit."

"We are also 'to consider best methods of work.' Method is always important, and particularly is it to be sought for in a young science or industry where long experience has not yet determined the best plans of procedure. It was well at first that a large amount of individuality should enter into the work and a variety of methods be employed. Then, by a process of natural selection, the poorer methods would gradually drop out and the better ones be retained. It is time for this Association to lay aside its swaddling clothes and assume the garb of maturer years. It should be one of its objects to determine upon best methods as soon as expedient to do so. One recommends Paris green or London purple in the proportion of 1 pound to 200 gallons of water, while another will make it one pound to 160 or even 100 gallons for the destruction of the same insect. One recommends two sprayings for the codling moth, another three, and another says spray often enough to keep the fruit covered with a layer of the poison, so as to be sure of killing the second brood. Some advise hellebore for the pear slug, while others prefer one of the arsenites, and still another would use quicklime or simply road dust. Surely there is need for more method and uniformity in our work and in our recommendations for the control of particular insects. By free discussions at these meetings much can be accomplished to this end."

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* The Editor desires to acknowledge his indebtedness to the official report of the proceedings of this meeting published by the U. S. Department of Agriculture.

The next object laid down is 'to give opportunity to individual workers of announcing proposed investigations, so as to bring out suggestions and prevent unnecessary duplication of work.' "This brings upon us the importance of systematic co-operation in our investigations; it has been often urged upon us, but not much progress has been made. One of the chief difficulties is that each one wishes to plan his own experiments and publish the results, in order that he may not have to share honours with another. Such a feeling is not altogether to be condemned; neither is it necessary to so plan our co-operation as to make it essential to remove credit from him to whom it belongs. Let us suppose two entomologists are planning independently to test the effect of insecticides upon foliage. Each carries through his experiments and publishes the results of his labors. They are still independent experiments, the results of one not supporting or contradicting to any great extent the results of the other. Had each known what was being planned by the other, they could have arranged to carry out their experiments so that they would be largely duplications of each other, and when the results were published we should have double evidence upon the points under consideration where results agreed; and where they disagreed, we might be able to find in the different conditions the reason for it. Such a co-operation would bring results of far greater value than those obtained by independent experimentation, and neither party would lose any glory; in fact, each would receive more credit because of the better conclusions that could be drawn from the work. And then how carefully every conclusion would be reached and backed by positive proof for fear that the other party might get different results! Such duplication as this is of the utmost importance to establish scientific truth, and the more we can have of it the better. It is only the 'unnecessary duplication of work' that our constitution deprecates."

"It is frequently the case that one is working out with considerable care the life habits of an insect, and a little information from exact observations upon some particular point in other localities would be of great service to him. The person giving the information would have full credit for what he did, and the world would have the benefit of the combined results. When time can not be taken by the head of a department for this aid, it may often be the case that a special student in entomology would be glad to get his name into a bulletin for doing a little good work. I have a case in mind to illustrate. The speaker is working on the life history of the codling moth. His observations make him wonder how it can be possible that there can be so few as one brood or so many as three or four anywhere. He would be greatly aided if a few entomologists in different parts of the country would make the following observations and report results this year. First, obtain date of blooming of the earliest apple trees. Second, determine the time of appearance of the first moths of the second brood by collecting a few of the earliest wormy apples and rearing the moths from them. Third, determine when the brood of worms that go over winter without pupation begin to leave the fruit. This can be done by placing cloth bands on the trees about July 15th, and removing the larvæ that appear under them once a week until those have been taken that do not change to a chrysalis within a short time. Then, with the other facts that have been well worked out, it will be possible to state with considerable definiteness the number of broods in different portions of the country."

The speaker next referred to the importance of having at each Experimental Station as complete collections as possible of insects in all their stages that are serious pests, and said that the only way in which this could be accomplished was by a system of mutual exchanges. After speaking very briefly on the third clause of the constitution 'to suggest, when possible, certain lines of investigation upon subjects of general interest,' he went on to the last clause, 'to promote the science and advance the study of entomology.'

"The usefulness of any applied science depends upon man's knowledge of the natural laws operating in that science. An astronomer could not determine the very day, hour, and minute when an eclipse of the sun would be visible at a particular spot on the earth's surface, or the exact date of the return of a comet, if he did not thoroughly understand the operation of the laws by which these marvellous phenomena are brought about. Neither can applied entomology accomplish its highest mission in the world for man's benefit until he succeeds in thoroughly working out and interpreting aright the laws which prevail in the insect world, and they are many and intricate, and some of them difficult of solution. Whatever we can do to interest others in the study of insect life, in any of its phases, to the end that new facts are recorded, will help to the more perfect understanding of our favorite science and consequently to its usefulness. We are greatly indebted to the pure systematist in entomology who never attempts to make a practical application of his knowledge."

"It would greatly promote the science of entomology if each member of this Asssociation would make a special systematic study of some groups of insects, however small, and publish the result as a personal contribution to the pure science of entomology. We would be better workers in economic problems for so doing. A study of the habits of insects in nature's laboratory fits one for a grade of systematic work that he never could attain as a closet naturalist."

"A knowledge of food plants, of broods, of local variations, and of variations occurring among the offspring of a single pair, determined by careful observation in nature's haunts or by breeding in the laboratory, is as essential to enable one to establish true specific differences as is a thorough knowledge of structural character."

"To promote a science it is necessary to make known its relations to human interests. If men can be shown that their health, wealth, or happiness depends upon a knowledge of insect life, there will be no trouble to interest people in the study of entomology. Show the farmer, the gardener, and the horticulturist the importance of knowing the habits of insects in order to successfully combat the pests that destroy their crops; bring to the attention of the preacher the inexhaustible fund of evidence and illustration with which to teach his flock the power, wisdom, mercy, care, and omnipresence of the Creator of all; make known to the artist the boundless field which a study of insects opens to him for the display and developement of his powers in portraying graceful and fantastic forms and in preparing and blending colors of the most exquisite beauty and harmony; teach those that instruct the young what a wealth of interesting and easily obtained objects are always at hand from insect life with which to fascinate the child and secure his lifelong interest in natural history study; make it plain to all that the very laws of life that prevail in the higher realm are equally patent among the creeping, crawling creatures of lower rank and smaller size—do all this, and the science of entomology will quickly take the rank it deserves among its sister sciences."

"In closing let me urge that we keep in mind the worthy objects for the promotion of which we are banded together. Let us keep the standard of work up to the ideal conceived by those in whose minds the organization had its birth. Let us show a willingness to sacrifice self-interest when it is necessary for the general good, and let us do all in our power to preserve and strengthen the fraternal feeling that has ever existed among our members."

In a subsequent discussion of the address, Prof. Webster said that there were very many features in it of vital importance to working entomologists. One thing he considered entitled to especial emphasis and that was the matter of duplication of work. The fact that one member was working upon a given species in one State or Province and another member was working upon exactly the same species in another region of country, while apparently a duplication of work is not really so, because in all probability very different results would be obtained. No two men see the same thing in the same light, and climate, latitude and elevation also have a great deal to do with the action of insects. As to the matter of mapping out work, it must be remembered that most entomologists are limited in their powers, and, while they can plan work, it is not always easy to carry it out, as a station director or a board of trustees might greatly revise his plans. In regard to the introduction of foreign parasites, it seemed to him that it is a field we are just entering, with the future all before us, and there would be many failures; but where such work was carried out carefully he believed it might prove successful with respect to a great many introduced species of insects. When we come to carry it out between States, how ever, other difficulties will surround us. He went to a great deal of pains to obtain from Professor Morgan an egg parasite of Murgantia, and after getting it established, it was swept out of existence during the winter of 1898–99, and no good has come from the introduction. He was also of the opinion that a great deal could be done by an exchange of experiences with insecticides, such as had taken place in the morning session, as insecticides seldom have the same effect in different portions of the country. It had always seemed to him that the work of the economic entomologist was very largely to work out life histories, and after he had done this and had found out methods that could be used to destroy the insect his duty ends and the work of the horticulturist and agriculturist begins. He did not think it ought to be necessary for an entomologist to make of himself a mechanical, hydraulic, or civil engineer.

Prof. Fernald referred to the remark just made by Mr. Webster to the effect that no two men saw the same thing in the same light, and said that the same was often true in listening to an address, for generally no two men got the same ideas from it. For him other parts of the address than those mentioned by other speakers had presented themselves with particular force, and especially those with reference to collections in connection with the insectary or entomological work of any kind. It seemed to him that the work of a station whether connected with a college or not, is most emphatically educational, for even if it be not educational to students or visitors, it is certainly educational to the workers at the station themselves, and by continually adding to such a collection they are adding to their education as well as to the education of the residents of the region. He had thus far found a great demand for collections rather different from those ordinarily met with. The ordinary collection contains the rare insects as frequently as it does the destructive ones, and by that he meant to uphold the question that was raised in the address with reference to how many of the common insects could be found in different collections. He suggested that, so far as his own experience goes, there are too few collections in which all stages are preserved in connection with the work that insects do. A large part of the material that he receives in Massachusetts does not contain any insect whatever, but simply a sample of the work of the insect which has either escaped from the box or was never inclosed. The problem in such cases is to tell what has done the damage by the damage itself. He found that his greatest help was to preserve specimens of the insect and of the work it was doing, and he used such specimens in the identification of material sent in, perhaps fifty times as often as any other specimens. Our collections, in his opinion, should be amplified along the lines of early stages and the work done by the insects, and such collections will appeal strongly to the people. The whole address was interesting and suggestive, but it was this feature which interested him most. He had also had experience with the Murgantia parasite obtained from Louisiana by the kindness of Mr. Morgan, and while he was now fortunate in not having Murgantia to deal with, it was a great relief, while searching around, to find that there was some one who could assist him, and he thought anything in that line should be encouraged, for when a man wants a thing of that sort he wants it badly.

Mr. Johnson said there was another important suggestion implied in the address, and that was the commercial side of entomology—if the term might be permitted. We have enough systematic entomologists at the present time, and perhaps enough economic entomologists, but we do need another lot of men who will take up purely the œcological side; that is, they must study conditions in the field. The day is coming, and is not far distant, when our great commercial railroads and some of our greatest manufacturing concerns, such as canneries, will employ œcological entomologists just as they employ engineers and other skilled labor. He felt quite certain that this would come about, and that a new field would open to young men especially, who would take up this commercial side of the entomological problem. To give an illustration of what he meant, he said he would try to bring this out in a paper which he would read on the following day on the subject of the pea louse in Maryland, which has destroyed more than $4,000,000 worth of green peas along the Atlantic coast this season.

When insect injury touches the pockets of the producers to that extent they are going to look about for the men who have a knowledge of the insects. It means money to them. He had been in consultation with some of the high officials of one of our principal railroads, and felt certain that the day is not far distant when these roads will employ men to take up the entomological study and development of the territory through which their lines run. He considered this an important point for the student of entomology to bear in mind. Of course such a man must go out and study conditions over a vast area. He must also know what our worthy chairman is doing in Colorado; what Mr. Weed is doing in New Hampshire; what Mr. Lounsbury is doing in South Africa; what Dr. Fletcher is doing in Canada—in short he must keep posted on the entomology of the whole world and be ready to meet any emergency.

Prof. Hopkins said that he found in the spruce forests of Maine that a large timber concern controlling some 300,000 acres employed a practical forester and scientific man, and paid him about $1,500 a year, to give advice on practical methods of cutting timber and making surveys. The concern mentioned sent this man with the speaker through the spruce forests of Maine to learn all he could about forest insects. This was another evidence of the fact that the practical men are beginning to realize that they can very profitably make use of the results of scientific research.

A vote of thanks to the chairman for his interesting and suggestive address was unanimously adopted.

Dr. L. O. Howard, in the first paper, detailed the operations performed in the introduction and establishment of the *Blastophaga* in the fig plantations of California, which had been carried on since the last meeting. The paper will be published in full in the Year-book of the U.S. Department of Agriculture for 1900.

ESTABLISHMENT OF A NEW BENEFICIAL INSECT IN CALIFORNIA.

A second note presented by Dr. Howard also related to the introduction of a beneficial insect. He stated that it would perhaps be remembered that at the tenth annual meeting of this Association he had referred to his efforts to introduce and establish in this country, with the assistance of Prof. Antonio Berlese, of Italy, the interesting Oriental parasite known as *Scutellista cyanea*. In Italy this curious parasite occurs commonly in the wax scale (*Ceroplastes rusci*), and it was introduced into Italy in all probability from the Orient about forty years ago, although originally described by Motschulsky in 1859 from specimens reared by Nietner in Ceylon from *Lecanium coffeæ*. The living specimens were sent by Dr. Berlese and his colleague, Dr. Leonardi, and were colonized at Baton Rouge, La.; also in Washington D.C., in the insectary of the Division of Entomology upon *Ceroplastes cirripediformis*. The Washington specimens did not succeed in perpetuating the species and nothing has been found since of the Louisiana material. A year later Mr. C. P. Lounsbury, government entomologist of Cape Colony, found this species parasitic upon *Lecanium oleæ*, the common black scale, in Cape Colony, and sent specimens to the writer for identification. The past spring, Mr. Lounsbury, at the writer's request, made formally through the United States Secretary of Agriculture to the Secretary of Agriculture of Cape Colony, brought with him from Cape Town to New York two boxes of twigs covered with the black scale affected with this parasite, and expressed them to Washington, whence they were immediately forwarded to Mr. E. M. Ehrhorn, the horticultural inspector of Santa Clara County, Cal. On June 19 the writer received a letter from Mr. Ehrhorn announcing the arrival in living and healthy condition of the parasites in question. The twigs in one box were somewhat mouldy but quite a number of parasites were crawling about in the box and were found in the pupal condition in some of the scales. Mr. Ehrhorn had been warned by telegraph and had prepared twenty-five infested oleander plants by potting them and had covered each with a tight bag of the finest Swiss muslin. In these most of the parasites were liberated and a few were allowed to fly in the orchard. Specimens of a hyperparasite (*Tetrastichus* sp.) also survived the journey, but Mr. Ehrhorn was on the lookout for this parasite and isolated them as they appeared, pending instructions from Washington as to their destruction. The writer had strong hope of the successful establishment of this species at San Jose, the climate being appropriate and the supply of food unlimited, and stated further that this was another instance of international entomological work which emphasized the fact that this Association through this class of work binds together its members all over the world more than any other association.

At the opening of the discussion on the paper, Dr. Howard said that he would be glad to hear from Mr. Lounsbury on the subject of this parasite of the black scale. He said he wished to add that Mr. Lounsbury had sent two boxes, one a deep box and the other a shallow one. The shallow box carried the more successfully; the scales had begun to rot in the deep one.

Mr. Lounsbury stated that the history of the case dated back to his first arrival in Cape Colony. Before he had been there a year he noticed that the black scale was not injurious, and upon travelling about the Colony he found the same condition true over many thousand miles of territory. Later, upon obtaining specimens of the parasite and corresponding with Mr. Howard on the subject, the latter had suggested his sending it to California. For four years he had been watching for an opportunity to get a sufficient number of parasites to send, but the scale is so well kept in check by the parasites or by other factors, that until this year he was unable to find a large quantity. Last year he mentioned the matter in his annual report; a copy of which he had sent to Mr. Ehrhorn, who at once wrote and asked him to take steps to get the parasite established in California. He replied that he would gladly do all he could, but would like Mr. Ehrhorn to make it a formal matter so that he might be able to spend the time and money necessary. This was done and Mr. Lounsbury received formal orders to go ahead. He set about it in two ways: First, he had scales collected and reared young larvæ from them, which were placed on young oleander trees now being kept in the Cape Town gardens. Primary parasites were to be admitted to the plants, but secondaries excluded. These plants in time he may be able to send to the United States in Wardian cases. Second, while waiting for these to develop he had Mr. Mally go out and search the country side, with the fortunate result that relatively large colonies of scale were found where Mr. Lounsbury had seen small colonies the year before. Mr. Mally collected for nearly a week and brought in over a bushel of twigs which were carefully sorted, cut into foot lengths, and the ends dipped into sealing wax. The twigs were then wrapped in tissue paper. The matter of the differently shaped boxes was purely accidental. He went to the grocery shop and picked out what he thought would be best suited, taking one shallow box and one deep box in order to try them. He thought that packed in the manner above described and placed in a wooden box, what moisture came would be absorbed by the wood. The boxes were packed the night preceding Mr. Lounsbury's departure, the deep box being placed on a dry shelf in the fruit room of the Cape steamer and the shallow box kept in the stateroom. In this way the insects were taken to England, which he hurried across and took the next liner. He then tried to get the box which he had kept in the fruit room also placed in a cool room on the New York steamer, but found no choice between putting it in the meat room or leaving it outside. He preferred not to freeze the insects because the parasites, not being accustomed to such temperature, might succumb, and he therefore placed the box in an empty cabin below the water line. The voyage was fortunately cool, the temperature averaging about 60°. The shallow box was kept in his stateroom, as on the Cape steamer, and immediately upon arrival in New York both boxes were shipped to Dr. Howard. They arrived in New York in 25 days from Cape Town, a quick passage which, perhaps, could not be repeated.

On being asked if the black scale in South Africa is destructive to citrus trees to the same extent as in California, Mr. Lounsbury replied that he had seen citrus trees infested in only about ten places in the last five years, and never more than a few scales at any of these places. Occasionally he had seen the scale on citrus trees from Natal or from Australia which had been imported to the Cape. One orchardist having several thousand trees, said he had seen a few on his Australian trees, but they had disappeared. He himself was unable to find any there after a year from the importation. It is not known of what country the scale is a native, but it must have been in Cape Colony for many years. It occurs most commonly on oleander, which at the Cape is an outdoor plant, and Myroporum. He had found it 150 miles inland and on numerous indigenous plants away from settlements.

TRANSMISSION OF PARASITES.

A conversation on the subject of the transmission of parasites from one region of country to another then followed. Mr. Johnson said that he had recently received a request from Mr. Ehrhorn of California, for parasites that prey in the East on the imported cabbage worm. It seemed to Mr. Johnson that this was a matter for co-operation, and he merely mentioned the fact as a suggestion from Mr. Ehrhorn that it is very desirable to establish such parasites in that section. He had promised to do what he could from his end of the line, and he hoped that others who were fortunate enough to possess such parasites would also assist. He had also received a request from Professor Morgan for specimens of the parasite which he had bred and which Mr. Howard had named. Professor Morgan is anxious to colonize this parasite on *Murgantia histrionica* in Louisiana, and Mr. Johnson had promised to send him parasitized eggs of the harlequin cabbage bug at the earliest opportunity, but up to the present time had been unable to find any specimens of this destructive pest. Three years ago it was one of the most destructive insects in the Maryland and Virginia cabbage-growing sections, but since the freeze of February, 1899, he had seen very few specimens. He was unable to say whether this was due entirely to the freeze or to the parasites. The parasite is a new species (*Encyrtus Johnsoni* Howard, Can. Ent. Vol. XXX, pp. 17, 18) and there seems to be some promise of its successful introduction into the South.

Mr. Gillettte said he considered the matter of parasites one of great interest, and he hoped the subject would be further discussed. In Colorado nature often seems out of balance. There are a number of species which are not abundant in the East, but which are very injurious in Colorado, and he thought it was because the parasites have not been carried to that section of the country. In his opinion it would be of the greatest benefit to certain portions of the country to introduce insect enemies, both parasitic and predaceous.

Dr. Howard said he desired to call the attention of the members of the Association to the fact that this was the most representative meeting of the Association ever held. Not only was Mr. Woodworth, of California, present, with Mr. Fernald, of Massachusetts, Mr. Weed, of New Hampshire, and Messrs Quaintance and Scott, of the Southern States, but also "our dear old friend," Mr. Fletcher, of Canada, and Mr. Lounsbury, who had carried American economic entomology clear across the Atlantic Ocean to South Africa. Mr. Currie, the under secretary of agriculture for Cape Colony, who was recently visiting Mr. Howard in Washington, had said that he was very glad indeed that he had sent for an American entomologist to come to the Cape, and congratulated his department upon being able to secure such a man as Mr. Lounsbury.

Dr. Howard presented a third note in which he gave an account of the useful work performed by the larvæ of a little lady-bird beetle, *Hyperaspis signata*, in destroying the scales on maple trees, *Pulvinaria acericola*, and also those of *P. innumerabilis*. These larvæ very much resemble the scales on which they feed.

Mr. E. P. Felt, State Entomologist of New York, read a paper on

SOME EFFECTS OF EARLY SPRING APPLICATION OF INSECTICIDES ON FRUIT-TREES.

He said that a series of tests had this spring been begun near Albany, N. Y., with the object of ascertaining the best method of controlling the San Jose Scale in orchards. During the progress of the work trees were treated with mechanical mixtures of water and kerosene, and of water and crude petroleum, using 20 and 25 per cent. of the oils and applying with a kero-water sprayer. A few trees were treated with undiluted kerosene and others with undiluted crude petroleum; a number of trees were also treated with caustic potash whale oil soap, at the rate of 2½ lbs. to a gallon of water, and some with a combination of the soap and crude petroleum in the proportion of one pound of soap to four gallons of water, and one gallon of the oil to ten gallons of the soap solution. The spraying was mostly done on April 11th and the work was performed in a mixed orchard of over 100 young pear, peach, plum and cherry trees, where the San José scale had been for about eight years, and the trees, therefore, presented every degree of infestation. The undiluted kerosene and crude petroleum were applied to the worst infested trees.

The spraying with the insecticides occurred just before the buds began to open, and with the exception of the trees treated with the undiluted oils very few or no harmful effects were observed. Eight days after spraying, the trees as a rule were budding out. Those treated with kerosene gave little indication of the presence of the oil on the bark, while the dark colour of those treated with crude petroleum was very apparent, a condition which still continues at the time of writing, June 20th. The whale-oil soaps showed to a considerable extent. Photographs were exhibited showing the harmlessness of mechanical 20 per cent. emulsions of either kerosene or crude petroleum, also of similar 25 per cent. emulsions. Other photographs showed positive injury from the use of undiluted kerosene, and most marked injury from undiluted crude petroleum; one plum tree was killed outright by the latter treatment.

Experiments undertaken in other localities also served to show that crude petroleum may seriously injure trees under certain conditions. The trees may eventually outgrow the harm, and it is possible that the injury may be no greater than the scale would have caused, if allowed to go unchecked. The mechanical dilutions of crude petroleum, at least up to 25 per cent., appear to be harmless if applied before the buds are open, and it is to be hoped that they will prove effective in controlling the scale.

A general discussion followed the reading of Mr. Felt's paper. Mr. Scott said that in Georgia undiluted crude petroleum killed peach and plum trees outright, but 50 per cent. and less strength did very little damage. The best results were obtained with 25 per cent. in mechanical mixture with water sprayed with a Gould kero water sprayer. The application was made just before the fruit buds opened in the spring; all the insects reached by the spray were killed, according to notes made up to June 12. Until that date the sprayed trees remained oily and the odor of the crude petroleum could yet be detected. It is a reasonable conclusion, then, that the scale can not live so long under such a coating of oil. He had concluded that the 25 per cent. crude petroleum in mechanical mixture was better than refined kerosene of the same strength.

Mr. Woodsworth said that when the bulletin from the New Jersey station came out it was heralded all over California, and he had to write more letters in regard to the kerosene and crude petroleum treatment than about any other insecticide. Crude petroleum in California is a very indefinite term, since there is a crude petroleum from Ventura which is as thick and black as molasses, and from that it varies to crude petroleum which is almost as thin as gasoline. Even in a single well the product varies according to depth and age, and distillations show that it varies greatly in composition. He had been assured that the Eastern product varied also, and was of opinion that before we can recommend any percentage of crude petroleum we will have to establish a criterion of excellence. The different kinds of crude petroleum he had experimented with in California produced very different results—strikingly different. There is also a very decided difference in results according to time of spraying with the same oil. Thus spraying before rain and after rain may produce entirely different results. He had sprayed with some forms of crude petroleum without injury which would have thoroughly destroyed the foliage at another time of day. The amount of water in the leaf may determine to a certain extent the damage by the oil. It seemed to him, therefore, that another thing that must be done before we can really properly understand the action of the oil will be to study the effect of the oil upon the vegetable tissue. Perhaps this had already been done, but it was still in large part a mystery to him.

Mr. Webster said he had used oil from two wells located in different parts of Ohio this year, and although the analysis ran almost exactly the same in each case the effect has been different. In the one case he had not seen the orchard for several weeks, but when he last saw it the peach trees seemed to have been in many instances killed by the use of crude petroleum. He could not say whether the oil had been applied just before or just after a rain. In the other case the trees sprayed were seedling apples on the experiment farm, the experiment being made to determine if possible the effect upon the trees and not against insects. Some of the trees leaved out at the proper time about as freely as usual, while others had no leaves at all. At the present time, however, there was no apparent difference whatever in them, all having finally leaved out precisely the same. It was evidently nothing but a temporary injury. His experiments had produced such various results that he was badly mixed up and did not favour recommending the use of kerosene of any sort. He was of the opinion that the variation would be just as great in the crude article as in the refined.

Mr. Hopkins said that in West Virginia they have a great variety of petroleum, from that as thick and black as molasses to the thin light-coloured product. The oil obtained from the Standard Oil Company is a mixture of all kinds except the heavy oil. The heavy oil is used for lubricating machinery. He had obtained some results which are quite at variance with the testimony of others and show what conflicting results can be obtained in different States. In one case he recommended crude petroleum as an experiment in a large orchard which was almost dead from the scale and which the owner refused to cut down. It had been sprayed once with pure kerosene, which did some damage and killed many scales, but the owner had allowed it to go without treatment and the scales had again covered the trees. He sprayed it with crude petroleum obtained in Baltimore. When he last saw the orchard, in April, the trees were black and greasy, but underneath the bark they were as healthy as ever, the leaves were coming out in full, and the owner claimed that the crude petroleum had benefited them. He was not recommending the oil, but simply giving this as an example. His spraying was done in February and wherever the oil touched the bark it remained dark and greasy for months afterwards. A thorough examination failed to reveal any of the living scales, and he believed that the young scales could not settle and live on the oily surface. He felt very much encouraged. It is one of those problems which require co-operative work. As a result of further investigation, he thinks it may become one of the best insecticides ever discovered. He could not think of any better work than trying to find the reasons for the great difference in results in experimental work with insecticides.

Mr. Webster said he was unable to see what could be gained even if crude petroleum should be perfected. It was true that we will have to get something cheaper and more effective than whale-oil soap, which if used on peach trees except during the winter will destroy the fruit, but in view of the difficulty he had had in getting crude petroleum and the high price asked for it, how much better an insecticide than whale-oil soap would we have even if it was perfected? He thought that entomologists who cared for their reputation would experiment much and say little for publication, for the present at least. He further stated that while experimentation was always in order, it would be best to stick to the whale-oil soap until more obscurities in regard to the use of petroleum had been eliminated.

Mr. Johnston said he agreed with Mr. Webster. We have got to get something better than kerosene for both peach and plum. In one instance he had sprayed an orchard of two hundred 9-year old peach trees in February with 25 per cent. kerosene and not a tree was living on the 28th of April last. It seemed to him that atmospheric conditions were at the bottom of the difficulty, and he thought it would be necessary to go back to the old whale-oil soap remedy, which destroyed the scale more effectively and was less liable to injure the trees. It would not be wise to substitute crude petroleum for whale-oil soap. After three years experience with the soap, kerosene and gas, he was of the opinion that there are other conditions which must be studied more seriously in the future than in the past, and he heartily agreed in the opinion that co-operation is desirable. He believed it would produce better results in the future. We must not confine our labours to the territorial boundaries of a State, but go outside for information, suggestions and experiences of others.

Dr. Fletcher remarked that he was glad to hear what had been said about whale-oil soap and crude petroleum. He had never yet been able to see what object there was in trying to use petroleum. The results were far too conflicting and always unsatisfactory, and the question of cost in the ruin of apparatus was never considered. There was very slight injury to the hose in the use of potash whale-oil soaps, which could now be obtained of pretty uniform manufacture and had been giving good results. These are always to be had, and are easy to get in most places, while he had found great difficulty in getting crude petroleum. He thought there was room for experiment with much weaker mixtures of the potash soaps during the summer. His experience was in favour of these soaps in preference to either crude petroleum or kerosene mixed with water. Even with the kerosene emulsion there is sometimes unexpected injury to the trees, which was always put down to difference in the oil or in the water. He was satisfied for the present that the whale-oil soap was the safest remedy, and it was the best for those who are official entomologists, who have to recommend formulæ to people who will make a mistake if they possibly can.

Mr. Sanderson related his experience with crude petroleum, which was favourable to its use. He had sprayed a pear orchard on the Delaware river with it in the latter part of January, on a cloudy day, followed by a little hail and rain soon afterwards. Two months later he sprayed another lot of 100 trees with a 25 per cent mixture; it was a very windy day and almost all the trees previously sprayed got a dose of the 25 per cent.

mixture on one side. Examination shows no injury on either lot. Here and there could be seen a tree not doing well, but that was owing to the spray of a year before with pure kerosene. The buds were not injured. The growers in his region never use whale-oil soap, because it destroys the buds. They have used it during midwinter and it destroyed buds, and have now given it up.

Mr. Woodworth said that he did not wish his former remarks to be construed to mean that there is no future for crude petroleum as an insecticide, but he desired to emphasize the fact that there is a great deal to learn. In some of the large orchards in California crude petroleum has been used with success, but not against the San Jose scale. He is of the opinion that there is a great future for crude petroleum, and that the time will come when it will be cheaper in the East. In California it is the cheapest insecticide that can be bought.

Three papers were read by Mr. Clarence M. Weed on "The oviposition of an egg parasite of Vanessa antiopa"; "The oviposition of Cacœcia cerasivorana," and "The relation of Pimpla conquisitor to Clisiocampa Americana." The last-named insect (*Pimpla*) is the most important parasite which attacks the pupa of the apple-tree tent-caterpillar.

HYDRO-CYANIC-ACID GAS.

The reading of a paper by Prof. Fernald on "The Marguerite Fly," which he has retained for publication elsewhere, led to a discussion regarding the use of hydro-cyanic acid gas.

Replying to a question from Mr. Johnson, as to whether hydro-cyanic acid gas had been used, Prof. Fernald stated that there was objection to the use of this substance among florists, who have an exaggerated idea of the danger involved and will not often use it. He had no doubt hydro-cyanic-acid gas would be more effective, but thought the florists would prefer to use carbon bisulphide, as this substance had proved satisfactory.

Dr. Fletcher thought that remedial work against the flies during the winter would be better than work against the larvæ after they have eaten the leaves.

Prof. Fernald replied that the problem had been thus far looked at by him entirely from the florists' standpoint, and the insect treated in the stage at which the florists would first see it and want to treat it. He was certain, however, that the fly could be handled by fumigating the greenhouses.

Mr. Johnson stated that one could not be too careful in the use of hydrocyanic-acid gas, and he wanted to caution all those who used it. In one instance, after preparing the chemicals necessary for generating the gas, he thought he would take his chances in dropping the cyanide in the jar and get out, but he felt the effects of the gas almost immediately. By the time he reached the door a haze came over his eyes, everything looked black, and a feeling similar to blind staggers overcame him. Experience has proved that it is not a trifling matter, and he would caution all who had occasion to use the gas. At the same time he felt that hydrocyanic-acid gas was the coming material for the destruction of certain insect pests in mills where stored grain and other products become infested. He had recently performed one of the largest experiments ever undertaken in the use of hydrocyanic acid gas, in a five-story brick mill in Canada. Over 150 pounds of potassium cyanide was discharged in the mill, and the results were very gratifying. It practically eliminated the flour moth from the mill.

Dr. Fletcher said he did not think enough care could be taken in giving instructions when recommending hydrocyanic-acid gas for general use, especially in this stage of introducing it, as a fatal case or two would put an end to its use entirely. Several striking instances had lately been mentioned which show the intensely poisonous nature of this gas. Much more care, instead of less, than has been exercised in the past is necessary. With regard to the use of bisulphide of carbon, he certainly was not satisfied with its use in mills and had not got the results promised for it. He was very sorry Mr. Marlatt was not present at the meeting, as his laisser-faire policy had given him a lot of trouble with the people he had to deal with, and he was of the opinion that some others of the Association might have liked to discuss that matter somewhat.

Mr. Webster stated that his fumigating houses in Ohio are covered carefully and made perfectly air tight by the use of layers of building paper, but if the ordinary nurseryman makes his own fumigating house he would not make it any more air-tight than a hencoop. He had tried almost every way of introducing the cyanide, but the man who did the work invariably complained of severe headache, until he devised a method of combining the mixtures under the floors.

Mr. Lounsbury suggested that a simple way was to have a small lead tube leading from the outside of the house. the vessel containing the cyanide being placed under the tube, the door closed and locked, and the water and acid freshly mixed being poured in through the little funnel or tube and the aperture closed.

Mr. A. L. Quaintance of the Georgia Experimental Station, read the next paper on *Diabrotica 12-punctata* which is a serious pest to corn in the Southern States. The injury to the plant is confined almost entirely to the work of the larvæ on the underground portions of the plant, as the roots and stem below the surface of the soil. The attack is mainly in the spring while the plants are quite young. The writer gave an account of the life history of the beetle and the experiments that had been made with a view to its control. He found that if eight to ten grains of corn be planted in each hill, the plants would not all be destroyed, and the injury from this Southern corn-root worm would be practically avoided, or so distributed that the damage would be trifling.

Mr. C. P. Lounsbury gave a long and very interesting account of his observations on the habits and associations of a number of species of Ticks that cause great annoyance and much injury to live stock in South Africa.

Mr. W. M. Scott presented a paper on the Coccidæ of Georgia in which he enumerated 41 species of scale insects that he had found in the State, and gave their localities and food-plants.

On Saturday morning, June 23rd, the Association met in joint session with the Society for the Promotion of Agricultural Science, the President of which (Prof. Beal) read his annual address. Dr. L. O. Howard gave an account of the progress of Economic Entomology in the United States, which is published in the year-book of the U.S. Department of Agriculture for 1899; and Mr. C. P. Gillette read a paper entitled "Apiary Notes."

NOTES UPON THE DESTRUCTIVE GREEN PEA LOUSE FOR 1900.

(*Nectarophora Destructor*, JOHNS).

By W. G Johnson, College Park, Md.

Perhaps no insect in recent years has attracted more attention than the destructive green pea louse. It became conspicuous, first, on account of its ravenous attacks upon the pea fields, a crop heretofore practically immune from the ravages of insects; and, secondly, from the fact that it was a species not recorded in science. What condition in nature was responsible for such a general distribution of a new species of insect the writer will not attempt to discuss in this short paper. It appeared last year, and was recorded for the first time, from Maine along the Atlantic coast southward to North Carolina, and westward to Wooster, Ohio. It was also observed in Nova Scotia and Ottawa, Canada. I had it sent to me from Massachusetts and Vermont in July and August, and complaints of its serious nature have come to me from Chillicothe, Ohio, Long Island, N.Y., portions of New Jersey, and Wisconsin (August). I first observed the pest May 18, 1899, and have had it under constant observation from that date to the present writing. I described the newcomer in the February issue of the Canadian Entomologist as *Nectarophora destructor*. A very long name, I admit, but if there is anything in a name being a burden to its possessor, we hope that this one will accomplish such a purpose.

From the first I have held that this insect is probably a clover pest. It has been observed upon both red and crimson clover, and this season hundreds of acres of red clover have been destroyed by it. In one instance, reported to me June 13, Mr. C. Silas Thomas, of Lander, Frederick County, Md., stated that the pest had almost entirely ruined 65 acres of red clover for him. Many other cases of a similar nature were reported or observed by us. The attack has been very common upon crimson clover also, but I have not heard of a field being killed by it. That clover, and perhaps the red clover, is its original food plant seems quite conclusive from our experiments and observations. I am of the opinion that red clover is its original food, and that it is, therefore, primarily a clover pest. Without doubt it is a native American insect, and has spread its attacks to crimson clover and field peas, as these two plants have encroached upon the feeding ground of the louse. It spends the winter, at least in the South, as an adult in clover fields. It may winter in another form farther north.

It is barely possible that this insect has other food plants and lives over winter upon them, but clover is, no doubt, the main plant upon which it lives. Mr. F. H. Chittenden, of the U.S. Department of Agriculture, Division of Entomology, in Washington, observed this insect, or one very closely allied to it, feeding upon a number of species of vetches in Washington this year.

From a long series of experiments in the laboratory we have shown that there are two kinds of females known at present, the winged and wingless forms. No male has as yet been discovered, and perhaps in the South none exists, and the insect remains over winter in the adult stage, as stated above, upon some plant, and in most instances this is clover. The female produces living young which reach maturity in from ten to fifteen days, and possibly less time in hot weather. As an example, a young one born March 4 reached maturity (winged form) March 16, or 12 days from time of birth, and was producing living young on March 19. From that date to April 17 it became the mother of 111 young and then died. Her first young (wingless form), born March 19, reached maturity and was producing on March 31, or eleven days from time of birth; from that date to April 13 she gave birth to 120 young and died. We have made many other observations of a similar character, but this will suffice to show the rapid reproductive powers of this insect, and we might state that in many instances where this insect was first observed on May 1, three weeks later the fields were abandoned on account of its attacks. Calculated from the average number of insects produced per day (which is 6), in six weeks one would become the progenitor of 423, 912.

It was estimated last year that the total loss from the attacks of the creature along the Atlantic Coast States was $3,000,000, and that the crop was only one-half the usual output. From information obtained from the largest growers, the most experienced seeds men, and most extensive dealers in this line of business, "The Trade," a canned goods journal published in Baltimore, has gathered the information that the crop of peas of the Atlantic Coast this year will not exceed, on the outside, one-third of what it was last year. This is about as serious as it can be, when it is taken into account that it is mostly due to this one pest, and that it is certain to increase its destructive powers from year to year, unless some factor in nature intervenes to check and retard its further development. With this condition of affairs it is not strange that farmers have become thoroughly discouraged and make the statement that they will be more cautious about planting peas for market purposes, or for the packer, in the future.

With this year's experience, however, we have shown conclusively in our experiments and practical works in the field that this insect can be kept in control to a very great extent if taken in hand in time. In the first place, the peas must be planted in rows 24 or 30 inches apart, and not broadcast or in drills, as has been the case over a wide area throughout many of the Southern States. As an illustration of this we may cite an instance on the place of Mr. C. H. Pearson, a large packer of Baltimore. His 600 acre pea plantation was practically saved by persistent and energetic efforts on his part this season. All the methods from a practical standpoint were tried on this place, and it was found that the brush and cultivator method was the most effective. Forty men were therefore engaged to work in the field, and the 600 acres were brushed and cultivated every third day for a period of two weeks, and in this manner the entire field was saved, netting the owner from 25,000 to 30,000 cases of peas of 2 dozen each. It is a fact which is not questioned by those who are familiar with this plantation that had not this persistent and energetic fight been followed, the greater portion of the peas would have been destroyed by the insect. Last year the peas over the same area were broadcast so there was no opportunity of fighting the pest, and as a consequence 480 acres were entirely ruined by it. This year, by changing the method, and by a new system of fighting the pest, the peas have been saved. Many other illustrations of a similar nature could be given where we have been following this method persistently in this State.

The brush and cultivator method is a simple one; a good pine switch is used to brush the vines backward and forward ahead of the Iron Age cultivator, drawn by one horse, and in this manner the insects are covered and a very large proportion of them destroyed. The cultivation should not be repeated until the third day, as it requires usually something over forty-eight hours for the destruction of the adult insects when covered with earth. On this plantation we also sprayed a large acreage to show the practical side of this work. Suffice it is to say that we have found that no spray can be used which can destroy a percentage of insects large enough to warrant the expense of the operation. In this instance we sprayed 100 acres in two days, and thoroughly tested the method from every standpoint, using various materials. We abandoned the spraying apparatus, and began the brush and cultivator method, which was followed up persistently, with the results already noted. We have also used the "brush and pan," in which a bushel of lice were caught to each row of 125 rods long.

Many natural enemies, such as parasitic and predaceous insects, have been found feeding upon this pest in the fields, and in this manner, no doubt, the number has been somewhat reduced The most important factor, however, we have observed in the destruction of this pest has been the fungous disease, *Empusa aphidis*, which was common during the early part of the season upon this insect, in both clover and pea fields. It is a contagious disease and destroys the pest in very large numbers, under certain conditions. In one instance we found 58 dead lice upon the undersurface of a single lobe of a clover leaf, and it was not an uncommon thing in June to find 15 or 20 dead lice upon the under surface of a pea leaf. With the rains which prevailed throughout this section of country during June, which fostered the developement of the disease, it spread rapidly throughout the infested fields, and as a consequence it was very difficult to find the pea-louse upon late peas. A careful examination of peas where the insects were abundant in June showed that they were practically free from them. We feel, therefore, that the climax, as far as the development of the insect this season, has been reached, and that these silent factors in nature are now actually reducing the pest to such a point that it may possibly be several years before it will be such a destructive pest in this section as it has been for the past two seasons. At any rate, the conditions are such that the farmer and canner have new hope, and we trust the future will bring fewer lice and more peas.

In discussing the paper, Prof. Hopkins enquired whether the insect were possibly an introduced species, and if there were any records of its previous occurrence in large numbers.

Mr. Johnson replied that, in his opinion, it was not an introduced pest, but an indigenous insect, which had multiplied enormously from the change of conditions. The only record he had regarding it was one made ten or twelve years ago by Mr. Beckwith at the Delaware station, and another of its occurrence along the Potomac River in 1887. In neither case, however, was it certain that it was the same insect, as no specimens had been preserved. The pea-growers state that the insect has been known to them for many years.

Prof Hopkins said that this case is such a complete parallel to the invasion of the pine-bark beetle, the trouble from which is now over, that it occurred to him that in this case, within the next few years, this insect will probably disappear or become exceedingly rare. He had taken the trouble, in connection with the investigation of the pine insect, to look up the history of invasions by indigenous insects, and found that they multiply rapidly for several years, become enormously destructive, and a few years later disappear. They are destroyed by parasites or by climatic conditions and soon become rare species. This happened in the case of the pine insect, which was scarcely heard of before, and was one of the rarest insects in collections until it suddenly occurred in 1891 in such enormous numbers as to destroy millions of dollars worth of timber, but now it is practically extinct. Not a single living specimen has been found since the fall of 1892. Prof. Johnson's paper shows the great importance of the work he has undertaken, and his experience will be of inestimable value in dealing with future outbreaks of the pea louse. He thought the farmers of Maryland would make a great mistake by changing their locations for growing peas until perhaps a year had elapsed, because if the rule follows in regard to sudden invasions by indigenous insects they will soon disappear or become rare.

Mr. Johnson said he was greatly obliged to Mr. Hopkins for his opinion, but there is so much money at stake that the growers could not let the matter rest awaiting nature's relief. He believed fungous diseases, especially *Empusa aphidis*, are one of the factors which will bring about the temporary disappearance of the pest.

Mr. Galloway said the point in regard to the appearance and disappearance of forms holds good in fungous attacks also, the most striking example being the potato blight. The same holds good in the passing of the Russian thistle. These things come and go and come again, and the principle holds good with fungous diseases as well as with insects

Papers were read by Mr. B. T. Galloway on "Progress in the Treatment of Plant Diseases in the United States," and by Prof. Webster on "Meteorological Influences on the Hessian Fly." These were retained for publication elsewhere. The meeting then adjourned to the Central Park to inspect Mr. Southwick's spraying outfit.

On reassembling in the afternoon an elaborate and valuable paper was presented by Messrs. E. D. Sanderson and C. L. Penny, of the Delaware Experiment Station, on "Hydrocyanic Acid Gas as an Insecticide on Low Growing Plants." The results of their experiments proved that this method of treatment is practicable, but, owing to its cost, only for plants of some considerable value and for relatively small areas. Under many circumstances it could be used to much better advantage than any other means of combating a pest, and often might be found effectual where no other method of extermination were possible.

Mr. Sanderson then presented a paper, "Notes from Delaware," in which he reported upon the most noticeable attacks of the year in that State, and dwelt particularly upon the destructive green-pea louse, which had already been under discussion. After giving an account of the various parasites which preyed upon the insect, he said :

"The enemies of the lice appear too late to prevent the bulk of the injury, and as the same was true last year, it seems impossible to place any dependence upon them. It seems evident, however, that the lice are attacked by a parasite while still in crimson clover (parasitized lice were also common on red clover), but are not parasitized until they have been on peas for some time. Is it not possible the sudden appearance of the lice last year may have been due to the severe winter, which killed off the parasites and other enemies which usually hold the lice in check on the clover and so reduce their numbers that but few of them spread to peas?"

"The very sudden appearance of this new species last year was a unique entomological surprise. Where it came from was a question. It would seem to me that the original food plant of the pest was clover and probably crimson clover. It is true that crimson clover is not grown in the North where the louse was found destructive last year, but it is entirely possible that it may have spread from sections in which crimson clover is grown to red clover in these localities, but have been held in check by its parasites, and remained unnoticed. Furthermore, the insect enemies of red clover have at various times received study without this species having been previously noted. On the other hand, there seems to be good evidence that the louse has been on crimson clover for several years. One of our best farmers, Mr. Frank Bancroft, of Camden, Del., tells me that he has seen what he judges to be the same louse on crimson clover for at least six or seven years. In 1890 crimson clover grown upon an experimental plot at the Delaware Station became so badly infested with a plant louse that it was feared it would be killed. Professor Beckwith's notes state (May 11, 1890) that these were exterminated by a fungous disease, and the clover was not seriously injured. Upon looking over the station collection I found specimens of *N. destructor* which unfortunately were without any label, but were among material which was unquestionably collected prior to 1896. Upon corresponding with Professor Beckwith he informed me that he distinctly remembered preserving specimens of the aphis in question. As his accession catalogue shows no such specimens to have been numbered, though by no means conclusive, the evidence is at least strongly circumstantial that *Nectarophora destructor* occurred in injurious numbers on crimson clover as early as 1890."

"As regards remedies, I have practically nothing new to offer. It evidently is important to plant crimson clover as far from peas as possible, and to turn it under as early as practicable."

APHELINUS FUSCIPENNIS AN IMPORTANT PARASITE UPON THE SAN JOSE SCALE IN EASTERN UNITED STATES.

By W. G. Johnson, College Park, Md.

For the past eight years the writer has been paying particular atttention to the parasites attacking scale insects. During this period many species have been bred, but not many specimens from any particular scale The instance cited below is, perhaps, the most important from the economic standpoint yet discovered in these observations.

Since we assumed charge of the State work in Maryland we have collected the San Jose scale on various food plants, and inclosed infested twigs, about 4 inches in length, in glass cylinder tubes open at both ends. The ends were closed with cotton, and if any parasites existed upon the scales they were easily detected and mounted for study. Only upon rare occasions have we taken more than a half dozen specimens from a single tube. This experience has been repeated year after year until the fall of 1899.

Of the four species of true parasites known to feed upon the San Jose scale, three of them have been bred in Maryland. So far as I know *Anaphes gracilis* How., bred by Dr. L. O. Howard from scales from Charles County, Md., has not been reared from this scale from any other State. *Aspidiophagus citrinus* Craw. has been reared only in California from this pest. *Aphelinus mytilaspidis* Le B. and *Aphelinus fuscipennis* How. have been reared from scales taken at the following places in this State: Riverside, Annapolis Junction, Araby, and Mitchellville. Last fall, however, I discovered a new locality for *A. fuscipennis* near Easton, Talbot County, in an infected orchard along the Miles River. The orchard contained a miscellaneous variety of fruits, and all the trees were quite seriously infested with the San Jose scale. Instructions had been given the owner to cut them down as soon as possible and burn them. A quantity of small branches incrusted with scale were brought to the laboratory and inclosed in breeding tubes. Much to my surprise these tubes were swarming with parasites a few days later From one tube 1,114 specimens of *Aphelinus fuscipennis* were taken; while a second tube gave 432, a third 1,478, and a fourth more than 1,000, but owing to an accident the count in the case last mentioned was not exact. The writer was greatly elated over the discovery, and immediately sent out the following statement to the State press:

I am advising my correspondents not to burn twigs and branches cut from trees infected with the San Jose scale. If the tree is so seriously infested it can not be saved, it should be dug up by the roots, trimmed, and the brush and wood piled in the orchard, where they should be left until about the 1st of June or longer. If the trees are to be sprayed with either a 25 per cent solution of kerosene and water, whale-oil soap (2 pounds in a gallon of water), or crude petroleum, the pruning should be done first and the cut branches gathered up and piled where the spray cannot reach them.

This is done to preserve the little friends nature has supplied to help keep the scale in check. If the twigs and branches are burned or sprayed the parasites would be destroyed, as they feed upon the scale insects and are now wintering under the shell-like cover protecting them. These parasites are very small, being scarcely visible to the naked eye, yet they play an important part in the economy of nature. They are wasp-like in general appearance and quite active. It would be very difficult to estimate the actual number of parasites present upon a 5 or 6 year old peach or plum tree, but it is safe to say that they would run into the millions if the parasitism was at same rate as upon the twigs in the tubes.

If I had burned these twigs I should have destroyed all the parasites. On the other hand, if I had left them on the ground in the orchard the little friends would have escaped and concentrated their attacks upon other trees where the scale had been missed by the sprays. It is clear, then, that by using a little judgment in these matters we can assist nature in restoring the balance she desires. Do not sit down and fold your arms thinking nature is going to restore this equilibrium at once; you must do your part faithfully and well. Prune your orchard as soon as possible and save every twig that contains a scale; then spray with a 25 per cent. solution of kerosene and water, using any first-class spray pump, or with whale-oil soap (2 pounds to a gallon of water), before the buds open.

There is no possibility of the scale spreading until some time after the 1st of June. The young begin to appear in the vicinity of Washington, D.C., June 10 to 15 [in 1900 young were seen by the writer crawling June 3 near Washington], and the insect continues to breed until very cold weather. We have seen young, just born, on trees as late as December 19. When a twig is cut off between, say, December 20 and May 15, there is no possible danger of the scale spreading from it. It is not possible to transfer one of these insects from one twig to another after it is "set" and formed a scale over its back, and all of them die as soon as the sap is dried out of a cut twig or branch. Badly infested trees of no commercial value should be cut down as soon as possible, before the buds open, and the brush piled. Do not leave the stump standing, as it may prove a veritable breeding place during the summer. If you are so unfortunate as to have this scale, remember that eternal vigilance must be the order of the day, and you will find before you are through with it that it is no trifling matter.

The orchard in question was not destroyed by burning, as first suggested, but the trees were pruned and the cuttings saved. In May, 1900, the writer had a large quantity of the branches from this orchard carefully packed and sent to Mr. W. W. Cobey, Grayson, Charles County; to Capt. R. S. Emory, Chestertown, Kent County, and to Hon. Charles G. Biggs, Sharpsburg, Washington County. Instructions were sent to place the infested branches in grape baskets and hang them about the orchard where the scale was most abundant In this manner we will establish *Aphelinus fuscipennis* in the various counties and under different conditions. We have every reason to believe that the experiment will prove successful.

In this case the study of parasitism has given us a valuable suggestion for the treatment of scale infested orchards, namely, never burn a twig or tree cut late in the fall, winter, or early spring. A positive remedy one day may be wrong the next day, just as we are able to unravel nature's secrets and interpret them for own good.

Since the above was read the writer has tested a lot of twigs from the Charles County orchard and has bred numerous specimens of *A. fuscipennis*, thus proving that a parasite is thoroughly established there.

Mr. A. H. Kirkland read a paper on "the Brown-tail Moth in Massachusetts," in which he gave an account of the natural spread of this injurious insect throughout the State. The infested area in 1896 was only 29 square miles; in 1899 this had increased to 928 square miles.

The next paper was by Mr. C. P. Gillette, who gave a series of interesting notes on some of the most important insects of Colorado. Mr. Johnson followed with "Notes on insects of economic importance in Maryland during 1900," and Prof Webster with an account of the "Insects of the year in Ohio." Foremost among these he placed the Hessian fly, regarding which he said: "In point of destruction the Hessian fly outranks every other insect, when considered in connection with the wheat crop of 1900. It is doubtful if there will be over 20 per cent of an average crop in Ohio; the remaining 80 per cent may be largely charged up to the ravages of this pest. As an average crop in Ohio amounts to, approximately, 40,000,000 bushels, the loss may be computed at 32,000-000 bushels, which at the ruling market price would mean a loss of $22,400,000, at least three-fourths of which, or $16,800,000 can be justly charged up to the ravages of the Hessian fly. More extended studies of this outbreak and some of the meteorological phenomena connected therewith are given in another paper. The unprecedented abundance of the pest this year may be attributed largely to the almost total lack of parasites, the retardation of the fall brood over the northern half of the State, and the extremely favorable weather during the autumn of 1899, which enabled all but the very latest deposited eggs to hatch and the larvæ develop to the "flaxseeds" and thereby defy the adverse influences of winter. In many localities the later sown wheat escaped fall attack and up to May 1, 1900, was uninjured, but the flies developing in the earlier sown fields seemed to have migrated *en masse* and settled down on those sown later, and the result is that in many cases the destruction is as complete in the one as in the other."

Mr. Woodworth gave a short account of the Entomological situation in the State of California, referring especially to Scale insects, the Codling moth, peach and grape insects. The last paper read was by Dr. Fletcher of Ottawa, who gave an account of the most noticeable insect attacks of the year in Canada, mentioning those affecting fruit trees, roots and vegetables, cereals, fodder-plants, and trees and shrubs.

Before the meeting closed, an interesting discussion took place on the matter of common names for insects, in which a number of the members took part. A committee was appointed to deal with the common names of such injurious insects as may be discovered in the future and to remove ungainly and inappropriate names.

The following officers were appointed for the ensuing year: President—C. P. Gillette, Fort Collins, Col.; First Vice-President—A. D. Hopkins, Morgantown, West Va; Second Vice-President—E. P. Felt, Albany, N. Y.; Secretary-Treasurer—A. L. Quaintance, Experiment, Ga.

The next meeting will be held at Denver, Col. on the 22nd and 23rd of August, 1901.

REGULATIONS RE SAN JOSE SCALE.

Extract from The Canada Gazette of Saturday, January 12, 1901.

ORDER IN COUNCIL.

His Excellency, in virtue of the provisions of section 5, chapter 23, 61 Victoria, intituled "An Act to protect Canada from the Insect Pest known as the San Jose Scale," and of 63-64 Victoria, chap. 31, "An Act to amend the San Jose Scale Act," and by and with the advice of the Queen's Privy Council for Canada, is pleased to order that exemption from the operations of the above mentioned Act shall be and is hereby authorized of any trees, shrubs, plants, vines, grafts, cuttings or buds, commonly called Nursery Stock from any country or state to which "The San Jose Scale Act" applies; and that all importations thereof shall be and are hereby permitted to be entered at the Customs Ports only of St. John, N.B., St. John's, Que., Niagara Falls and Windsor, Ont., and Winnipeg, Manitoba, between the following dates in each year: 15th March to 15th May in the spring, and 7th October to 7th December, in the autumn; and at Vancouver, British Columbia, during the winter months only from 15th October to 15th March, at which ports they will be thoroughly fumigated with hydrocyanic acid gas by a competent Government official in accordance with the most approved methods.

All shipments made in accordance with the above will be entirely at the risk of the shippers or consignees, the Government assuming no risk whatever.

Packages must be addressed so as to enter Canada at one of the above named ports of entry, and the route by which they will be shipped must be clearly stated upon each package.

As it is well known that well matured and thoroughly dormant nursery stock may be safely treated, but that there is danger of serious injury to the trees if fumigated in the autumn before the buds are thoroughly dormant, or in the spring after the buds have begun to unfold, all stock which when received is immature or too far advanced for safe treatment will be refused entry and held at the risk of the shipper.

His Excellency, in virtue of the provisions of section 7 of the Act first above mentioned, is pleased to direct that the authority herein granted be published in the *Canada Gazette.*

JOHN J. McGEE,
Clerk of the Privy Council.

OTTAWA.

OBITUARY.

Mr. JOSEPH EVELEIGH TREFFRY died at Quebec, of spinal meningitis on the 27th day of April last—his second wife had died but a few months before. Mr. Treffry belonged to a Cornish family. He came to Canada about thirty years ago, and at first lived in Montreal. After a while he moved to Quebec, and for ten years was reporter and proof-reader on the staff of the *Morning Chronicle.* He left newspaper employment to accept the Government position of English translator in which he continued till his death. He had been a member of the Quebec Branch of the Entomological Society of Ontario from its formation; and his ready pen and ability as a journalist had often been exercised in its favour. Before his bereavement his wit and good humour had added greatly to the interest of the meetings of the branch. He was buried in Mount Hermon Cemetery.

T. W. F.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

The second Annual Meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, on 16th January, 1901. It was a meeting essentially in the interests of farmers. At the request of the President, the chair was taken by Mr. F. H. Wolley-Dod, of Calgary, who was supported by the vice-President, Rev. M. White, and several well-known farmers of the district. A number of letters in support of the objects of the Society were read, including letters from Mr. C. W. Peterson, Deputy Commissioner of Agriculture, N.W.T.; Prof. C. C. James, Deputy Minister of Agriculture, Ontario; Dr. James Fletcher, Dominion Entomologist, and the Right Reverend the Bishop of Calgary and Saskatchewan.

The President of the Society, Percy B. Gregson, on being called upon (after the opening remarks by the Chairman) explained that the object of the Society was to instruct and interest the farmers of the North-West regarding the insects that affect them,—to bring home to them individually the principles which underlie the treatment of insect and weed pests, so that they can deal with them in time, without waiting, as so many do, till their crops are destroyed before applying for advice. Mr. Gregson stated that farmers were beginning to appreciate the value of the study of insects, and this was evidenced by the fact that a number of Agricultural Societies had during 1900 become active supporting members of the North-West Entomological Society. Mr. Gregson impressed on farmers the importance of careful observance of the habits of the insects that came under their notice, such as their time of appearance, their method of feeding, the nature of their food, etc. Some insects, such as beetles and caterpillars, feed by nibbling their food, and poison should therefore be placed on their food, so that the insects when consuming the leaf will also consume the poison with it. Other insects such as lice, pierce through the outside of the leaf with their trunk-like beaks, and poison, therefore will not reach them. As however, insects breathe through little openings in their sides they can be suffocated by anything which clogs up their breathing valves, such as coal oil emulsion, or the fumes of tobacco.

The list of injurious insects in the North-West is already a long one, and as insects always follow cultivation, we must, as the country gets cultivated, expect arrivals of fresh insects. There are very many ways by which insects are always liable to be imported into a new country. They may come in clothes, lumber, domestic animals, packing substances (such as hay, straw or grass). It was probably in packing substances that all the grass stem maggots, common to Europe and America, have reached us, including the Hessian fly, the wheat stem midge, and wheat stem saw-fly.

In applying remedies there is a reason for each different remedy recommended, and in the list of insects presently given the reason for each remedy can readily be seen.

THE PRINCIPAL INJURIOUS INSECTS OF THE NORTH WEST FOR 1900.

The Red Turnip-beetle (*Entomoscelis adonidis*). In many places from south of Calgary to north of Edmonton, and in Saskatchewan and several districts in Assiniboia this beetle has been more or less abundant—in some instances devastating entire fields. Around Beulah, in Manitoba, it has also been somewhat abundant, but chiefly confined to mustards. Remedy: Spray the plants with Paris Green solution (1 lb. to 160 gallons of water) and stir in also 1 lb. of quick-lime, or if in small quantity, ½ oz. of Paris Green, ½ oz. of quicklime, and a pail-full of water. In mixing Paris Green Dr. Fletcher recommends that it should first be made into a paste with a small quantity of warm water, and the paste afterwards mixed with the larger amount of water required. If it does not adhere readily to the leaf, a little soap added to the water will overcome the difficulty.

The Turnip flea Beetle (*Phyllotreta vittata*) has been very general throughout the North-west Territories, but the damage done was not great, owing to a counter-attraction in the shape of mustards. Remedy: Dust the young turnips with dry Paris Green and land plaster, or dry Paris Green and sifted ashes when the dew is on the young turnips. This little beetle hatches in May—about the third week—and by deferring sowing the turnips until June the beetle will have hatched and disappeared to native cruciferous plants before the young turnips are up.

The Diamond Back Moth (*Plutella cruciferarum*) in June and early July was extremely abundant throughout the Territories and in many parts of Manitoba, practically the whole of the cultivated area of Alberta, Assiniboia and Saskatchewan was visited by this pest, and many fields of cabbages, cauliflowers and turnips were completely destroyed. The larvæ of this moth also attacked lettuces, radishes, rape, etc. A field of turnips badly infested with this pest presents a weird and ghastly appearance. The riddled leaves are bleached and white like skeletons. Parasites have destroyed immense numbers of the larvæ. Remedy, as to turnips, young cabbages, etc., except lettuces: Paris Green solution as recommended for the Red Turnip-beetle. The chief difficulty is in getting at the underside of the leaf, as the larvæ principally attack from underneath, In the case of lettuces, hellebore should be used. Scatter on the leaves—as much underneath as possible—when the dew is on, a mixture of 1 lb. of hellebore to 2 lbs. of sifted ashes.

The Colorado Beetle (or Potato-bug) has again made its appearance in Central Alberta, though not in large numbers. On 28th June both larvæ and mature insects were seen in several potato fields, but no great damage done. As this is the second year of appearance of this insect in Alberta it is possible these are an advance guard, and it is well to look out for them. Remedy, the same as for the Red Turnip-beetle. Do not kill the lady-birds. This bright scarlet little beetle and its larvæ greedily devour the young larvæ of the Colorado beetle.

The Three-lined potato-beetle has been more troublesome than the Colorado beetle. In some localities in the south of Central Alberta it has seriously damaged potato crops, but its presence elsewhere has not been reported. This beetle was the chief insect pest of potatoes in Ontario until the arrival of the Colorado beetle, which it seems to have heralded. Remedy, the same as for the Red Turnip-beetle.

The Rocky Mountain Locust has been very bad in parts of Manitoba, north of Douglas, and around Aweme. This pest is dealt with in the May, June and July numbers of the leading agricultural journals, issued from Winnipeg, so fully and clearly that its characteristics and remedies need not be repeated at length. In the Nor'-West Farmer, for instance, of 21st May, 1900, is a very good account of them. The insect lays its eggs in the soil among the stubble in the early fall (August and September) and they hatch in the following spring. If, therefore, the soil be deeply fall plowed the eggs will be buried so deep that the young when they hatch cannot get to the surface.

Cutworms,—(in Alberta and Assiniboia principally the garden ones such as *Agrotis clandestina*, *Plusia brassicæ*, and *Carneades ochrogaster*) have caused the usual amount of loss and replanting in several districts among cabbage and cauliflower growers. It is difficult to understand why there need be any loss from this pest when the remedy is so easy. Remedy: Take say 50 lbs. of bran and very slightly moisten it with water, and sweeten with a little sugar. Then mix well with it enough Paris Green to just color the bran (e.-g. about a lb. of Paris green). The cutworms will eat this bran in preference to the cabbages. The common cutworm is not a climber, so wrapping a piece of smooth paper about 3 inches in breadth around the stem of the young cabbage when planting out is a good preventive remedy. The paper should be ½ an inch below the surface of the soil and 2½ inches above. Keep the garden clear of weeds and rubbish, old cabbages or cabbage stalks in the fall, so that the cutworm moth will have no attraction for laying its eggs. A more serious trouble, however, has been caused by another kind of cutworm in Manitoba. This is the glassy cutworm (*Hadena devastatrix*), and it, in the spring, committed very serious injury to wheat crops north of Stonewall. This pest was present in some fields in thousands, and marched in a phalanx devouring as they travelled. The remedy for the glassy cutworm is not easy. The grub burrows into the earth in the daytime, and comes to the surface to feed at night. It eats the whole plant, beginning just below the surface. Thoroughly spraying the grain along the front of their attack for a space of ten feet with a solution of Paris Green has been found successful. If however the crop has been ruined, turn chickens or turkeys into the field for a day or two, and then sowing oats for green feed might be tried.

Wireworms. These are the larvæ of the "click beetles." This is a pest very difficult to get at. There are several species of wireworm. They pass the winter in cells in the soil, so that for some species a plowing in August, and for others a plowing late in the fall, will disturb these cells and kill the inmates by exposure. Seeding down only encourages the wireworm, but barley and rye seem distasteful to this pest, and fair crops of these can be grown even if the field be badly infested with it; and possibly the field itself be ultimately cleared of the pest.

Among pests of foliage has been the pallid aspen beetle. The loathsome larvæ of this beetle were very destructive to the early leaves of aspen poplars throughout Alberta and the Territories, and considerably marred their beauty. Remedy: Poison their food by spraying with Paris Green solution.

The striped cottonwood beetle was also very abundant on willows. The fetid larvæ emit, when disturbed, a milk-like fluid from tubercles along their back, and trail a sticky fluid wherever they crawl upon the leaf. This is a very troublesome pest in the East, in districts where osiers are cultivated. The larvæ as well as the beetle cause the osier canes to branch by injuring the tips. Should osiers be cultivated in the Northwest this pest will be on hand. Remedy: Paris green or green arsenite solution sprayed on the food.

Lice on poplars and plants have been common in many parts of Alberta. *Remedy:* Suffocation by coal oil emulsion, or fumes of tobacco. The Western Blister Beetle was reported like "swarms of bees" on beans at Lethbridge in Southern Alberta about 25th June. Other blister beetles were abundant on vetches in Central and Northern Alberta.

Fleas. Towards the end of summer this pest became an intolerable nuisance throughout the Northwest. Hay mattresses swarmed with them. A slight odor of carbolic acid will prevent them from coming into a room so scented; but if introduced with hay or otherwise, then burning pyrethrum powder is a good remedy for driving them out.

Warbles in cattle appear to be on the increase. Cattle farmers are very well acquainted with this fly, but it is a trouble that is too apt to be treated as of not a very serious nature, and as not preventable. This, however, is a great mistake. In the first place the bot maggot, or warble, so damages the hides that grubby hides sell for one-third less than sound ones. But the beef itself is rendered so inferior that buyers of the highest class of meat, who supply hotels, &c., will not on any account buy carcasses showing traces of warble attack. Such beef has therefore to be sold at a lessened price below that obtainable for good beef, the reduction sometimes amounting to $5 per carcass. In view of the large and increasing exports of beef (cold stored) to England, it becomes important to see that the reputation of the Northwest is sustained by keeping stock free from this pest. In dairies, too, the loss sustained through the attacks of warbles is just as serious. There is the loss in quantity of flow of milk as well as deterioration in quality, resulting from the annoyance of the animals by the flies when depositing their eggs, and later by the grubs. The shrinkage in the milk is estimated at 10 per cent. and the deterioration in quality at the same rate, making a total of 20 per cent. By the time the warbles are discovered in the spring the mischief is done. Certain localities are more particularly infested than others, and a dry season seems more encouraging to the warble fly than a wet season, and where there is danger of the warble the animals should be protected during the summer months by spraying them occasionally with strong smelling oils, such as fish oil, train oil, kerosene emulsion, &c.

To make kerosene or coal oil emulsion add to 1 gal. of kerosene hot soap suds made of ½ gal. of water (rain water preferred) and ¼ lb. soap. Then churn all thoroughly together till it will adhere to the surface of glass without oiliness. When required for use, dilute the emulsion by adding from 9 to 15 times its measure of warm water.

After the close of the discussion consequent on the President's address, the officers of the Society for the year 1901 were elected. The officers for 1900 were re-elected in the capacities respectively held by them with the exception of A. D. Gregson, who retired from the curatorship, the same being accepted by Percy B. Gregson, the collections having been safely removed to his house.

Mr. F. H. Wolley-Dod most generously presented to the Society a large number of Lepidoptera, the bulk of which were new to the collection.

Mr. O. O. Poling, of Quincy, also presented to the Society several exceedingly rare specimens including Neophasia Terlootii and Erebia Magdalena. Some of these specimens are represented in but one or two other collections in the world.

After a vote of thanks to the Chairman, the proceedings terminated.

REPORT OF THE COUNCIL.

On behalf of the Council of the North West (Canada) Entomological Society, the President begs respectfully to submit the following report:

Several fresh works have been added to the library of the Society during 1900, among them being a complete set of "Insect Life," (partly the gift of Dr. L. O. Howard and partly by purchase). The impossibility in this distant country of access to an outside Library of any kind has been and is an obstacle which the Society hopes gradually to surmount by accumulating serviceable works of its own.

It is encouraging to note that the farmers are taking a marked and growing interest in economic entomology,—the President having during the past year given by request addresses or papers on twelve occasions and at various places in Alberta and Saskatchewan. Various agricultural societies have become active supporting members of the North-West Entomological Society.

A field class of young folk has been started in Lacombe, and operations (all being well) will be commenced in the ensuing spring.

A most welcome assistance has been received from the Territorial Government in the form of an annual grant of $25 towards furthering the objects of the society.

Acting on the advice of the original supporters of the Society, it was decided to defer attempting the issue of a magazine for a year, and in the meantime the president has, without cost to the society, circulated a large number of agricultural papers among farmers whenever such papers published matters of interest in economic entomology.

PERCY B. GREGSON,
President

1st January, 1901.

AUDITORS' REPORT.

Receipts and expenditure of the North-west (Canada) Entomological Society:

Receipts.		*Expenditure.*	
Members' Fees	$26 00	Library	$26 00
Territorial Government Grant	25 00	Stationery	7 00
Deficit (met by President)	38 50	Meetings (Farmers' etc.)	23 00
		Printing account	6 50
		Cork, pins, etc.	5 00
		Store books, glass, etc. and other apparatus	8 00
		Expense account (postage, etc)	7 00
		Subscriptions to periodicals	7 00
	$89 50		$89 50

I hereby certify that I have examined the books and vouchers of the Treasurer of the North-West (Canada) Entomological Society and find them correct, and the above is a true statement of the accounts of the Society.

J. L. TIPPING,
Auditor.

Waghorn, 1st. January, 1901.

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MAY 14 1902

THIRTY-SECOND ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1901.

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.*)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

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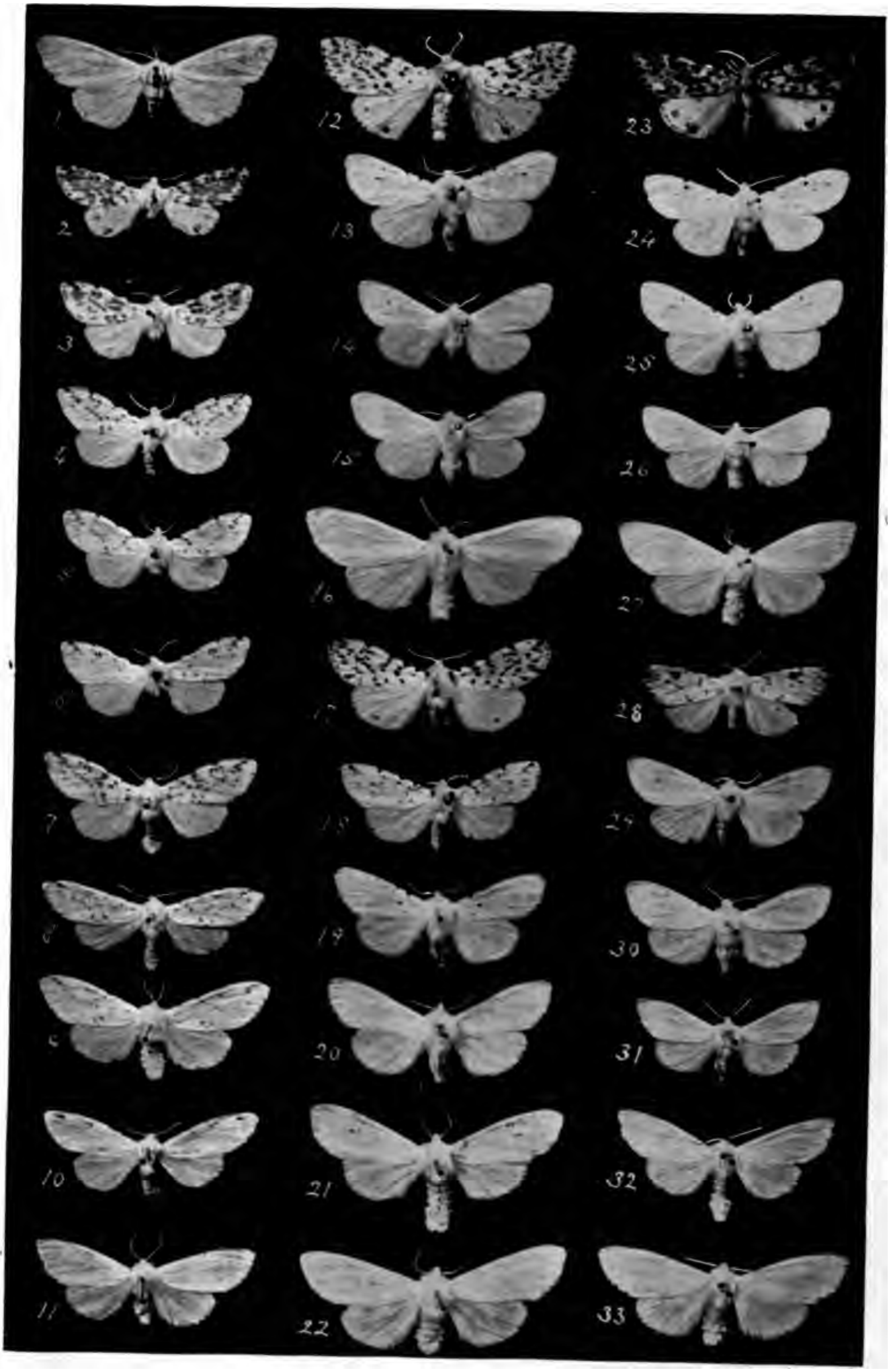
Miss Eleanor A. Ormerod, LL.D., F.R. Met. Soc., F.E.S.
Hon. Member Ent. Soc., Ontario, etc., etc.



HYPHANTRIA CUNEA, Drury.

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THIRTY-SECOND ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO,

1901.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to present herewith the Thirty-Second Annual Report of the Entomological Society of Ontario.

The thirty-eighth annual meeting of the Society was held in London on the 13th and 14th of November, 1901, at which the members had the gratification of your presence and participation in the proceedings. During the sessions the officers for the ensuing year were elected; reports were presented by the various branches, sections and officers of the Society, including the audited financial statement of the Treasurer; and papers and addresses were given on a variety of entomological subjects, many of which are of great practical value.

The Society's monthly magazine, the *Canadian Entomologist*, has been regularly issued during the year and has now completed its thirty-third volume. Its circulation in all parts of the world continues to increase and its high scientific character has been ably maintained by a large number of contributors.

I have the honor to be, Sir,

Your obedient Servant,

CHARLES J. S. BETHUNE,
Editor.

LONDON, ONTARIO.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-eighth annual meeting of the Entomological Society of Ontario was held in London on Wednesday and Thursday, the 13th and 14th of November, 1901. The chair was occupied by the Rev. Dr. Fyles, of South Quebec, President. Among the members present were Dr. James Fletcher and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. Henry H. Lyman, Montreal; Mr. John D. Evans, Trenton; Prof. Lochhead, Ontario Agricultural College, Guelph; Mr. Geo. E. Fisher, Inspector of Scale Insects, Freeman, Ont.; Mr. Charles H. Young, Hurdman's Bridge, Ont.; Prof. F. M. Webster, State Entomologist, Wooster, Ohio; Revs. Canon Dann and Dr Bethune; Drs. W. J. and H. A. Stevenson, Dr. Woolverton, Messrs. J. A. Balkwill, J. H. Bowman, J. Dearness, John Law, J. Alston Moffat, W. E. Saunders, R. W. Rennie, E. A. Brown, Demster, Thompson, Lochhead, and many other residents of London. The Society was also favored with the presence of the Hon. J. Dryden, Minister of Agriculture for Ontario, and Mr. G. C. Creelman Superintendent of the Farmers' Institutes of Ontario.

Letters expressing regret at their inability to attend were received from Directors, W. H. Harrington, Ottawa; D. G. Cox, Toronto; and James Johnston, Bartonville; and from Messrs. E. M. Walker, Toronto; A. F. Winn and Dwight Brainerd, Montreal.

The morning of Wednesday, November 13th, was taken up with a meeting of the Council for the transaction of the business of the Society and the preparation of their annual report. In the afternoon the Society met at 2.30 o'clock and at once proceeded to discuss the progress, present aspect and future outlook of the San José scale in Ontario The President, Dr. Fyles, expressed his gratification at the presence of so many eminent men at their meeting and felt assured that the conference they were entering upon would be of great value both to themselves and to all interested in fruit culture in this Province.

SAN JOSÉ SCALE DISCUSSION.

At the request of the President, MR. GEORGE E. FISHER, of Freeman, Ont., the Provincial Inspector of Scale insects, opened the discussion. The following is a condensed summary of his address: I wish to state at the outset and to emphasize very strongly the fact that very few fresh localities have been found this year infested by the San José scale. This is very encouraging and leads us to feel that the prospects of stamping it out are not altogether hopeless. People are now realizing better than ever before how dangerous an enemy it is; but it is remarkable how many mistakes were made in identifying the scale, the oyster-shell bark-louse, the scurfy bark-louse, and others, being mistaken for it. In the localities where the scale is present, its increase and destructiveness have been greater than ever before; it does not confine itself to one place, but reaches out into new localities beyond its former limits. As an illustration of the very great increase of the scale, I may give one instance. There is an orchard of 1,600 peach trees which was inspected in August, 1899, by seven experienced men; they spent six days in their examination and only found the scale on 87 trees, showing that the infestation was but slight. In August of the following year, 1900, I could find the scale on every tree I looked at, but still a good crop of fruit was produced. This year (1901) that orchard is practically dead; it will never bear another crop of fruit; the scale is to be seen everywhere throughout it. There are quite a number of just such orchards as that, and they constitute an object lesson which is constantly before the people—they cannot close their eyes to a dead orchard. In another orchard I have eaten peaches this last summer gathered from trees which have since become encrusted with the scale and will soon die from the attack.

There is a third orchard that I know of, a large orchard, from which about 25,000 baskets of peaches were picked this year. About the 25th of September I visited it and found the scale on every tree along a row reaching across the orchard; unless this orchard is put under proper treatment at once it has only one more year to live The alarming rapidity with which the scale spreads when once it has found lodgment causes it to be so destructive and so difficult to control. Thus far I have spoken of peach trees, but the scale attacks other kinds also. We have instances of plum trees, pear trees and even apple trees which are dead from the attack of the scale. Apple trees I have found more resistant than peach and was inclined at first to think that they would not be much affected, but the evidence to the contrary is too conclusive when we find apple trees which have been killed outright by the scale. The lower limbs are usually attacked first and then it spreads upwards till the whole tree is infested. I visited an apple orchard of 350 trees in 1899 which was then bearing well; the scale was found but the infestation was slight. Last year it bore a good crop of fruit, but it is doomed and will never bear again—most of the trees will be dead next year.

Now, as to remedies. There are four which serve good purposes. These are whale-oil soap; crude petroleum, and a combination of these two; lime, salt and sulphur (the favorite wash in California); and fumigation with hydro-cyanic acid gas. Whale-oil soap should be made strong, 2½ lbs. of good soap to a gallon of hot water, and should be applied freely to saturate every part of the tree. Many people sprayed only one side of their trees, waiting for the wind to change to do the other, and ending by leaving it undone. Others sprayed the trunk where there was no scale and left the boughs alone, though they were full of it.

Crude petroleum should be applied with great care; it seems to be perfectly safe when used for apple trees, which stand it better than any others, but is very dangerous for peach trees. I have never seen an apple tree which has been injured by it in this country; in New Jersey some trees have been killed, but it was not the crude petroleum that was used. I have found better results from it than from whale-oil soap, and it has also the advantage of being cheaper. The combination of soap and oil is a remedy which requires to be worked out. I am doubtful about it at present but I believe that it will yet prove an excellent remedy when the right proportions have been ascertained by experiment. Fifteen per cent, crude petroleum with water kills the scale but endangers the tree; 25 per cent. with 1 lb. whale-oil soap and a gallon of water is effective and not injurious to the same extent.

Lime, salt and sulphur as a remedy I like very much, but it is difficult to prepare; it requires some convenient mode of cooking, which is the important part, and the apparatus necessary for this is not always to be had. When cooked half a day, using lime that had been slacked in boiling water, it worked well, and so whitened every part of the tree that it reached that its application could be clearly seen; no portion of the tree should be left untouched. The reason this wash is so much more effective in California is because there are no heavy rains there to wash it off. Still, it can be used to good purpose here. Last May was very wet, and it began to rain while we were treating some trees and continued for a long time, yet the wash was successful, and we expect still better results in dry weather.

Fumigation with hydro-cyanic acid gas we tried at different points and at different times during the season, beginning in April and continuing till September. Over 300 trees were treated and a single live scale cannot be found on one of them. In the orchards trees affected by scale were marked and fumigated, the rest were sprayed. It is a troublesome and expensive *remedy,* but it will pay the fruit-grower to use it, when he would otherwise lose his trees.

If crude petroleum is applied to the trees as late as possible before the buds open in spring it covers the parts treated with a film of paraffine which remains on the trees during most of the summer and effectually keeps off the scale.

Hon. J. Dryden: Which treatment would you put first? Can you depend on any of them to destroy the scale?

Mr. Fisher: There is no doubt that crude petroleum is the best for destroying the scale, but it cannot be used with safety on some trees. I should not think of using it on peach trees which were in any way weakened; it should only be applied to the most healthy and vigorous trees. It can, however, be safely used on apple, pear and most plum trees, but not on Japanese or egg plums. Where it can be trusted its effect on the trees is very good indeed. One great difficulty is that the ordinary nozzles are too coarse. I should much prefer a finer one than those made. (Here he exhibited three nozzles—one made by the Spramotor Co., of London, Ont., the other two finer ones that were made by a watchmaker according to his instructions).

Whale-oil soap is a very useful remedy for peach trees which would not stand the petroleum treatment. It should be thoroughly applied until the trees are completely saturated and the scale is entirely soaked. The difficulty regarding it is that it is too expensive. It costs 12 cents for soap to spray each peach tree, while the crude petroleum would only cost 2 cents. A combination of the soap and the oil would cost from 4 to 5 cents. The lime, salt and sulphur wash, taking the lime at 12 cents, the salt at 8 and the sulphur at 30, would cost 1 cent per gallon or 2 cents per tree, using two gallons to a tree. Fumigation costs from 15 to 17 cents for the chemicals required for a full grown peach tree.

The peach tree grower should allow the branches to grow close to the ground without a long trunk, the lowest branches being only a foot above the surface. This produces a tree which is better than a tall one for picking, for spraying, for fumigation and for obtaining shelter; it also has no long trunk for harbouring borers.

He found that in using crude petroleum with 20 p.c. water more trees were killed by the Ontario oil than by the American, the latter being much heavier. The specific gravity of the Ontario oil was 39½ and that of the American 44½. The former was procured from Wallacetown, Ont., through David Barr of Dutton, and the latter from Titusville, Penn. Undiluted oil sprayed with an ordinary nozzle would kill all trees.

The speaker then gave an account of some of his experiences during the past season. One instance was an orchard at St. Catharines in which he treated a block of trees; these are all healthy now, while east of them, only twenty yards distant, there are three or four rows of peach trees which were partially treated by the owner and have since all died.

Near Niagara 370 trees, plum and pear, were inspected on September 20th and found so much infested with scale that they could not stand them during the remainder of the season and the fruit was no good. He made a light application with 25 gals. crude petroleum, half a pint to a tree diluted with 25 p.c. of water; it did not hurt the trees and killed most of the scales. These trees will be treated again in the spring. The addition of water to the oil increases the volume and enables the oil to be more readily sprayed; it soon evaporates and leaves only the oil on the trees.

I cannot—he said—recommend any remedy that will fit *every* case, nor any nozzle. These may be one-fourteenth inch, one-twentieth, one twenty-fifth, one-thirty-third, one-fiftieth and one-sixty-sixth. One-fortieth is a good size; it makes a very fine spray, and the operator can regulate without difficulty the amount applied, as it works more slowly than a coarse one.

Mr. John Law: Does this nozzle ever get clogged?

Mr. Fisher: No; the pressure keeps it clear. A long extension pipe should not be used; the shorter it is the better for satisfactory work.

After replying to several questions regarding spraying apparatus, materials and methods of application, Mr. Fisher said: I find now that there is an entire change of feeling amongst the people. Two years ago they had not seen trees killed by the scale; now such cases are frequent and they furnish an object lesson which cannot be misunderstood. Fruit growers who find the scale on their trees, realize that something must be done and done without delay. Experience now shows the wisdom of the methods adopted by the Department of Agriculture, though so much objection was made at first. The only sure and perfectly effective remedy is *burning up* all infested trees. Had we begun our investigations a few years sooner we should have succeeded in getting rid of the scale altogether in this Province, but when once introduced into the country it is no easy matter to trace its whereabouts.

In the fall of 1898 we started out with a long list of suspected nursery stock and on investigation found trees infested with the scale in 100 places. These trees were taken out and burned as fast as they were found, and now the localities where they grew are entirely free from the scale. This, together with the splendid work that has been done in the nurseries, has saved the country from a deluge of scale.

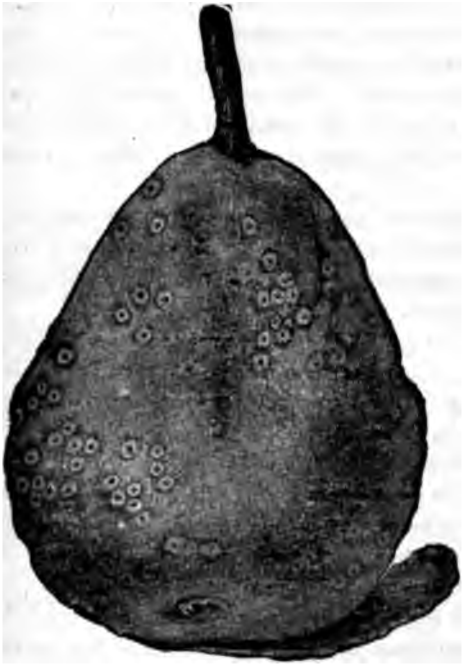

Fig. 1. Pear infested with the San José scale.

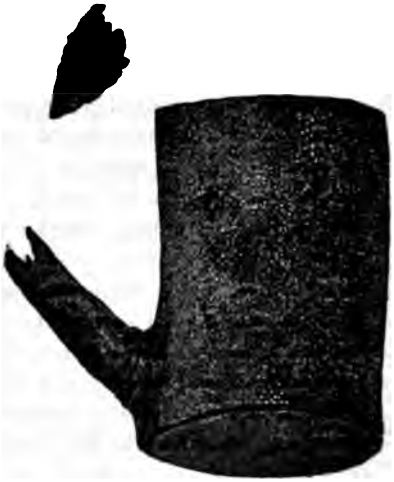

Fig. 2. Portion of a branch infested with the San José scale.

In the infested districts the increase and spread of the scale is very great indeed; but where we have treated the trees, even for one year, the insect is under control. The situation is very much improved and I believe, from the results of our work, that by careful treatment we can control the scale and preserve the fruitfulness of our trees. Where good work has been done for one or two years, the results are such as to justify us in coming to this belief. If the treatment were universal, there would be no spread of the scale.

In answer to questions Mr. Fisher said that many who formerly objected are now treating their trees as they have learnt the necessity for it and seen the good results. The best time for treatment is the month of April. No body of men sent out from the Department of Agriculture could cover the affected territory within that month, it is therefore absolutely necessary that the work should be done by the owners of the trees, who are, of course, the parties most interested in the matter.

THE SAN JOSÉ SCALE IN OHIO AND IN ONTARIO.

Dr. Fletcher, of Ottawa, considered this meeting one of more than usual importance. No subject which had ever engaged the attention of entomologists could compare with that of the injuries done by the San José scale, and the finding of a practical remedy. The Federal, Provincial and State Governments in Canada and the United States had done everything possible to direct the attention of fruit growers and gardeners to the danger of neglecting this terrible pest and allowing it to spread through the country. Much good work had been done, but further experiments were necessary before a quite satisfactory answer could be given to the vital question: "Is there any definite, practical remedy for the San José scale?" He congratulated the Society that the Hon. John Dryden had considered the meeting of importance enough for him to leave his other work in a very busy department to come to London to encourage the Society and to hear the latest views on the subject. The leading entomologists of the world, in America, in Australia and in other countries were now directing their efforts to this very question of getting an effective, easy and cheap remedy for the San José scale.

The speaker had been fortuate enough recently to have an opportunity of going right through the infested areas in Ohio and Ontario and examining the experiments which had been tried to control it. In the first place, it should be stated that the San José scale only exists at the present time, as far as Canada is concerned, in one corner of the Province of Ontario, extending along the shores of Lakes Ontario and Erie in the Niagara Peninsula. The important experiments which had been carried on during the past season by Professor F. M. Webster in Ohio and by Mr. Geo. E. Fisher in Ontario were most instructive, and the results were really very similar in nature. In passing through these infested areas it was noticeable on both sides of the line that it was the same insect with the same habits in both places, the climate and the soil conditions were the same, and the fruit trees and fruit growers were identically of the same nature. The San José scale is without any doubt a terribly destructive insect, but it is so inconspicuous and difficult to detect when in small numbers, that there has been difficulty in getting farmers to appreciate how great the danger is. The great outcry nowadays is for definite information. The speaker claimed that the present occasion demanded, and he intended to make, very definite statements, founded on his recent investigations in Ohio and Ontario, and he knew these would be backed up and confirmed by Prof. Webster and Mr. Fisher, both of whom were present.

In the first place, with regard to the possibility of the San José scale killing trees in Canada. Many had hoped that Canada was too far north for the scale to increase rapidly enough to kill trees outright. In reply to this he had to say that he had recently seen plums and peaches which had been quite killed in two years from the time they were found to be first infested, and many other trees which, although not actually killed, were so seriously injured that they were practically useless. Even apple trees, which were thought to be much better able to withstand the attacks of the scale, were in many places, and particularly with some varieties, so much damaged that they were much disfigured by having a large number of their lower branches killed. It must, therefore, be concluded that the San José scale not only had killed trees outright in Canada in a very few years, but that its powers to increase and do harm are just as bad here as they are in other localities where it has gained a foothold.

The Ohio experiments, carefully planned and worked out by Prof. Webster and his expert assistants, showed plainly the benefit of special training in this kind of work. It was most noticeable that where orchards had been carefully sprayed excellent results had followed. This was particularly the case where the work had been done by the entomologists; however, where good practical fruit growers had carried out the instructions carefully the trees had been protected and paying crops had been secured. The advantage of experience was very conspicuous in some of these orchards, the owners acknowledging that, although they thought they had done good work the first year, they were now able themselves to see that the second year's work was far better done than the first and they would be in a better position again next year to do the work better and more thoroughly. Some fruit growers had sprayed their trees in a perfunctory manner and had done little good. Spraying, to be effective, must be done with the greatest care as to every detail and with the greatest thoroughness, so that every part of the tree may be treated with the application. There are of course difficulties in spraying as well as in every other operation which is worth doing ; not only must the apparatus be of the very best, but the materials must be of the proper kind and mixed in exact proportions. The applications must be made at special seasons of the year, and it will pay fruitgrowers to see to this important operation themselves.

With regard to a definite remedy, Dr. Fletcher claimed that a definite remedy for the San José scale had already been given to the country. There was nothing particularly new as to methods of work nor which could not be found by everyone in the report of the Inspector of San José scale, which was available for all who would ask for it from Mr. Dryden's department. This was published last spring, and was a most valuable report. It was very regrettable that so few people who owned orchards seemed to be aware of its contents, or there would not be so many enquiries for a definite remedy when the good results given in that report showed that paying crops could be grown in orchards infested with the San José scale if they would regularly apply the remedies which were recommended by Mr. Fisher. In passing recently through infested areas, the fact was borne in upon him that if trees were treated every year, either with the whale-oil soap solution or the crude petroleum application, or, where the size of the trees would allow of it, if they were fumigated every year, paying crops could be grown, and he believed that the trees would year by year become freer from this pernicious enemy. Where trees had been neglected for only a single year, they had become coated with the scale so as to be almost or quite as bad as they were before they were treated.

The three remedies which the speaker claimed were definite practical remedies, were as follows :

(1) Whale-oil soap. This is a potash fish oil soap which can be purchased of good quality of some Canadian firms, of W.H.Owen of Catawba Island, Ohio, and of Good & Co. of Philadelphia, or it can be made with care and with a great deal of trouble by a private individual. To be effective, this mixture must be made of the strength of two and one-half pounds of whale-oil soap to the imperial gallon of water. To dissolve thoroughly, it must be mixed with hot water and is best applied just before the buds burst in the spring. Although, as a general statement, orchards treated with this soap mixture were not so free of the scale as those which had been treated with crude petroleum, still at the same time it was a fact that the two cleanest of those orchards lately examined which at one time had been infested and had been subsequently to a certain measure cleaned up, had been brought to their present good condition by the use of whale-oil soap. There were no very bad trees in these two orchards and scales could only be found with difficulty.

For peach trees this remedy is decidedly the safest to use. Its only drawback is the cost of the material. In large quantities it can be purchased, or made, for about 3½ cents a pound, and of the strength above advised it would require one and a half gallons of mixture containing 3¾ pounds of soap to an average size full-grown peach tree, making about 12 cents for material to each tree. The great advantage is that there is no danger of injuring the trees, and, further than this, the amount of potash in the soap makes it a decidedly beneficial application as a fertilizer.

(2) Crude petroleum. This mineral oil is decidedly more fatal in its effects both upon the scale insects and upon the trees. There are some matters connected with the effect of crude oil upon *various fruit trees which* still require elucidation, but both Prof. Webster and Mr. Fisher are

working hard on this subject, and, from the progress which has already been made, it is probable that before long their careful experiments (which it is of the utmost importance should be continued) will give results by which the danger of injuring the trees by inexperienced workers will be reduced. Crude petroleum may with care be applied to healthy peach trees as strong as 20 or 25 per cent. of a mechanical mixture with water, but it is very difficult to mix properly, and if applied carelessly or by reckless or inexperienced men there is great risk of the trees being killed. It is not always easy to detect when a tree is enfeebled, and injury may sometimes result to trees which are apparently healthy, but which on examination will be found to have suffered from some other cause. In applying crude petroleum, experience seems to show that one great difficulty is to get a pump which will always throw the exact percentage of oil that is shown by the oil gauge. A perfect pump has never yet been produced and this has always been a difficulty. When in Ohio recently, the speaker was much pleased to hear the London Spramotor Co. pump spoken of in the highest terms, but even this is susceptible of considerable improvement. Another danger may arise from the operator going over his work twice, and of course in that way depositing on the tree twice the percentage of oil necessary. Mr. Fisher's plan is to use not more than one quart of crude oil costing 2 or 3 cents to each tree. The crude petroleum has two great advantages over other remedies if experiments will show us how we can use it without danger to the trees. It is exceedingly cheap, and it leaves a deposit on the trees even after the volatile portion has evaporated. This deposit is vaseline and has the double advantage of showing clearly on the trees what parts have been sprayed and at the same time rendering the bark unsuitable for the young scales to settle upon.

[Some striking examples were here exhibited of bark taken from the two sides of a badly sprayed tree, one showing plainly the residue of the petroleum and no living scales, the other showing no sign of oil and thickly caked over with living scale insects. One piece of bark had on one side of it masses of dead scales as far as the oil had reached and beyond that, where there was no oil, a thick coating of living scale insects.]

Crude petroleum, therefore, is an effective remedy, but great care must be exercised in using it. The great danger will be next year. Carefully watched over and helped by Prof. Webster and his assistants in Ohio and by Mr. Fisher and his assistants in Ontario, remarkably good results have been obtained by some fruit growers; very little harm has been done to peach trees and none at all to apple, pear and plum trees. This state of affairs might probably engender a spirit of recklessness, and the speaker was afraid that next year there would be much loss from fruit growers using the crude oil recklessly or carelessly. There was no doubt at all that many who had even purchased crude oil this year had abstained from using it, for fear of injuring their trees, but had watched the outcome of their neighbours' experiments. As no cases of injury had occurred, a great many trees would be treated next year. It was therefore most important to advise caution.

(3) Fumigation. The most effective remedy is fumigation with hydrocyanic acid gas, which will destroy every living insect, but which if applied as recommended will do no harm at all to the trees. For small trees this has proved very useful, but for large trees the necessary tents and apparatus are expensive and there are difficulties which have yet to be overcome in the way of getting the gas equally diffused beneath the tents.

Summing up what he had brought before the meeting, Dr. Fletcher claimed that, notwithstanding the great danger which still exists from the presence of the San José scale in Canadian orchards, the experiments of entomologists had provided remedies which were as practicable and as effective as those which were used for many other injurious insects, and that by their regular use trees could be kept in health and in a bearing condition. He would not believe that the extermination of the San José scale from Canadian orchards was an impossibility. What could be done on one tree could be done on many. Combination, and co-operation were what was most needed in this matter, and, in the same way that farmers did not nowadays thresh their own grain but had this done for them by men who made a special business of doing it, he looked forward to the time when expert sprayers who knew their business, would travel from place to place spraying orchards for the various insect enemies. By this means, better work would be done and at a smaller cost than if each fruit grower did his own work. Fruit growers must remember that the application of these remedies was no easy matter which could be attended to by an untrained man. The Ohio and Ontario work were one huge experiment which was being keenly watched by scientific men and political economists. It was not a matter of the prosperity of a few individuals and the protection of their orchards, but of the discovery of a practical means of saving one of the most important industries of the country. This was not to be calculated by a few thousand dollars but by millions, as any one could see who would consider the amount of capital invested in orchards in Canada and the United States and then visit the dying neglected orchards.

It was a matter of congratulation that Prof. Webster was present ; he is one of the most highly esteemed of the scientific workers in entomology in the world and has taken up this matter ; nor was the Province of Ontario less fortunate. Mr. Fisher's enthusiasm and his peculiar adaptability for the delicate and difficult work which he had undertaken were apparent to all. The speaker trusted that these gentlemen would continue their important experiments in the directions which they had explained to him, and he felt convinced that substantial advance would be the result of another year's investigations. The Society had invited Prof. Webster to be present at this meeting, knowing that his advice and suggestions would be of extreme value. Mr. Fisher has been for some years a member of our Society, and we all know how reliable he is.

Professor Webster, of Ohio, was next called upon to address the meeting. He said that the problem they had to solve in Ohio was exactly the same as in Ontario, and it was the most tremendous the world had ever had to face as regards insects. He was constantly asked for a *cheap, easy and perfect* remedy, but such was not to be had ; however nearly it approached perfection it could not be easy nor could it be very cheap. Machinery was required which could not be produced in a day, but would be the result of long-continued experiments and constant improvements. He had not yet been able to find a good sprayer ; the best so far made [it was gratifying to hear] was made in London, Ontario, by the Spramotor Co., but it was capable of improvement. In time, no doubt, we shall get what we want. It was the same with insecticides ; we have not yet found out the very best materials and their combinations.

We know that countries differ, and that fruits which flourish in one region cannot be successfully grown in another. And so it is with insects ; they vary very much in numbers and in injuriousness in different localities ; some, for instance are destructive in Southern Ohio which do no harm in the northern part of the State. What people expect us entomologists to do is to provide them something that can be put in an orchard at no cost, and with no attention will kill all the noxious insects and not affect the beneficial ones.

(He then described the construction of fumigating houses, and stated that they had made them with slatted floors so that the deadly materials could be shoved under without danger.)

In addition to good apparatus, trained men were also wanted in order to do the work properly, just as skilled men were required for driving an engine. Such men should be provided with good machinery and then go about the country. They could do the work far better and much cheaper than untrained men ; there was an opening here for a paying occupation. And it was one in which almost continual employment could be obtained ; for instance, in July there would be the spraying of vineyards with Bordeaux mixture, later on the fall treatment for scale, all winter the same treatments, in the spring spraying for codling-moth, plum curculio, etc., *then Bordeaux mixture*, and so on—something to do nearly all the year round.

In Ohio, trees hopelessly attacked with the scale are marked for destruction and the owner is compelled to destroy them. Others less badly infested must either be destroyed or sprayed with whale-oil soap or crude petroleum and water, and the owners are held responsible for any damage arising from neglect.

At the present time, if remedies are properly used, we can reduce the scale 90 per cent. in one year ; the other 10 per cent. cannot be exterminated. One tree might be absolutely cleared of the scale, but a whole orchard cannot. The condition of vitality of the trees makes a great difference. Thrifty young peach trees will stand 25 per cent. to 30 per cent. crude petroleum, while older and feebler trees were killed with 25 per cent. He now uses 20 per cent. of oil with one pound of whale oil soap. On the whole he considered that we are getting on as well as we can possibly expect.

Dr. Fletcher : Why cannot we kill the last 10 per cent. ? If we spray with crude petroleum this year there will be a covering of vaseline left on the trees ; this will be increased the second year and the third, and at length the tree will become unsuitable for the scale and free from danger of attack.

Prof. Webster : There is no difficulty in treating apple-trees in this way and securing immunity ; but I was speaking of peach-trees which cannot stand the same amount of petroleum. I agree with Mr. Fisher that the heavier oil is the most satisfactory.

Mr. Fisher stated that he had treated infested trees for three years in succession ; they recovered health and vigour, and bore fruit, and were not injured by the continuous treatment.

Prof. Lochhead expressed his sense of the importance of the subject under discussion and his appreciation of the value of the information that had been imparted by the speakers.

Hon. J Dryden said that he had listened with great interest to the excellent addresses of the speakers, and was rejoiced to learn that definite measures for the extermination of the scale could now be adopted. It was undoubtedly a most serious danger to the fruit industry of this Province, and every possible means must be employed for its removal. The difficulty at the outset was to persuade the public that this danger existed ; many people do not believe it even now. Nothing can be done to enforce remedies unless people believe in the deadly character of the scale. The application of the remedies must rest with the people themselves, but they must be taught what the remedies are and how they are to use them. This is what the Government should do and is trying to do.

But how are we to impress this upon the people ? The answer is by education—by teaching them first the danger and then the means with which to combat it. The Entomological Society and the Fruit Growers' Association could do good work in this respect. Every fruit grower in the Province must be impressed with the danger to his own fruit and also to that of his neighbour, if this scale is not repressed. At the beginning of the operations for its extermination, drastic methods were adopted because it was supposed that the scale was confined to a few spots only, and we wished to exterminate it. This system was continued till considerable opposition was aroused and some excitement was created. An endeavor was made to find out the range of the insect and what the cost of its extermination would be ; if the information received was correct, $300,000 would have been required for compensation. If half a million dollars would wipe it out now the Government would gladly pay it. At present we are trying to hold it in check and to prevent its spread.

Educate, educate, must be their watchword. From now on we must strive to teach people about this scale—how to deal with it and what the danger from it is. It would be a great thing to teach people how to spray by sending competent men about whom they could *see* doing it ; no matter how plain written directions might be, they were of little use unless people were shown how to do it. This was the experience in improving the butter-making of the country.

The great danger lay in our nurseries, from which scale-infested stock might be sent out and the insect planted all over the country. We had an instance of this in the 100 trees two years ago to which Mr. Fisher has referred. How is this danger to be overcome? Inspection alone is not enough, as some scales in a nursery may be overlooked even by the keenest inspector. The only plan then is to require compulsory fumigation of all nursery stock before it is sent out, and this must be done by a man sent by the Government, who shall see that the fumigating house is perfect and the work perfect. This is all that we now have to prevent with certainty the dissemination of the scale, but we shall have to go further and allow no stock to be sent out of a nursery that is in an infested district.

It is desirable that further experiments should be made with the gas treatment. The ordinary man will not believe that infested trees in the middle of a waggon load and tightly tied together can be reached by the gas. This should be tested. The fumigating house must be constantly inspected to see that there is no leakage, and this work must be done by an officer of the Government.

On the whole Mr. Dryden felt that we were in a better position now than this time last year, and he felt very hopeful for the future. He had great confidence in the efforts that were being made for the preservation of our fruit trees, and believed that if the danger were once fully and generally realized, our fruit-growers would spare no efforts to exterminate the scourge.

PROF. WEBSTER stated that he had tried infested trees soaked in water and others daubed with mud, and in no case had a scale got through the fumigating house alive.

HON. J. DRYDEN: There are thousands of trees in a nursery. If there should be only two or three scales on a small tree, how can inspectors tell their presence? It is therefore absolutely necessary to resort to fumigation.

DR. FLETCHER quite agreed with this, but considered the inspection of nurseries most important for the discovery of infested places and he believed it to be a very wise provision.

MR. FISHER said that an experienced inspector could discover the scales in a marvellous way, and would often detect them where the owner of the trees failed to see any. With regard to the 100 trees destroyed, already referred to, he considered that the destruction of each one was worth a thousand dollars to the country.

EVENING MEETING.

A meeting, to which the members of the London Horticultural Society and the public generally were invited, was held in a lecture room at the Normal School. Notwithstanding the inclemency of the weather, the first snowstorm of the season prevailing at the time, the hall was completely filled by a very appreciative audience. At 8 o'clock the meeting was called to order by the President, Rev. Dr. Fyles, South Quebec, who spoke of the honor done to the Society by the presence of the Hon. John Dryden, Minister of Agriculture for Ontario, and by his kindly consenting to preside that evening.

The **HON. J. DRYDEN** then took the chair and delivered the opening address. He said that he esteemed it a great honor to preside over a meeting of the Entomological Society, which was one of the best as well as the oldest of the associations aided by the Government of Ontario. It had always been composed of gentlemen of wealth, of education, and above all of public spirit, who were willing to devote their time and ability to the objects of the Society. While it was one of the oldest, it was also one of the most useful associations connected with his Department in the opinion of a practical man like himself. We need its accurate work and we have been greatly aided and helped by it during all the nearly forty years of its existence; no doubt we shall continue to be helped by it during the years to come. He was present at this annual meeting to show his interest in the Society, and the interest which was taken in it by the Government and the Legislature of Ontario. He should like to inspire everyone with thusiasm in the work of the Society which was doing so much for the country by its studies of insect life both in its destructive and beneficial aspects. He congratulated the members on their extensive collections of insects and their library, which was the best of its kind in this country, and would be found most useful by young men of scientific tastes.

The **Rev. Dr. Fyles**, of South Quebec, read his presidential address and illustrated it with a number of beautifully executed colored diagrams, the work of his own hand. His charming manner and choice diction added to the interest of the subject, and held the unflagging attention which was bestowed by the audience.

THE IMPORTANCE OF ENTOMOLOGICAL STUDIES TO THE COMMUNITY AT LARGE.

By the Rev. Thomas W. Fyles, D.C.L., F.L.S.

The poet Crabbe gives us a glimpse of an entomologist of his day. He says,—

"There is my friend the Weaver: strong desires
Reign in his breast; 'tis beauty he admires:
See! to the shady grove he takes his way,
And feels in hope the raptures of the day—
Eager he looks: and soon, to glad his eyes,
From the sweet bower, by nature form'd arise
Bright troops of virgin moths and fresh-born butterflies;

* * * * * * *

"Above the sovereign oak, a sovereign skims,
The purple Emp'ror, strong in wing and limbs:
There fair Camilla takes her flight serene,
Adonis blue, and Paphia silver-queen;
With every filmy fly from mead or bower,
And hungry Sphinx who threads the honey'd flower."

Crabbe wrote in no unkindly spirit, for he was himself a naturalist; but, by the general public of his time the entomologist was regarded as one who rode a useless hobby, as one who wasted his time in trivialities.

Yet, doubtless, it was better that the weaver should spend his leisure hours in the woods and fields, improving his health by exercise and fresh air, and having a definite purpose in view, than that he should idle them away in the frouzy haunts of men of his class. We may well believe that he would return to his usual avocations with greater courage, because of the pleasure and refreshment that his outing, amid—what Hood calls,—

"The boundless prodigality of nature,
The balm, the bliss, the beauty and the bloom,"

had given him.

For some years before Crabbe's death, the friendly Stephens, to benefit just such entomologists as Crabbe had portrayed, opened his doors on every Wednesday evening, and received both acquaintances and strangers alike—placing his books and his fine collections at their service, identifying specimens for them, and giving them scientific information.

Stephens died in 1852: but the Wednesday evening "at homes" were continued by Stainton, editor of "The Entomologist's Weekly Intelligencer," at his residence at Lewisham.

The services rendered to the cause of English entomology by Stephens, Stainton, Newman,* Douglas,† and others of their time, ought never to be forgotten. They raised entomology in public estimation; they changed many a mere collector into a useful man of science; and they prepared the public mind to welcome the publications of the entomological authors who came after them.

I think Stainton's "Manual of Butterflies and Moths" (in two volumes) was the most complete work of the kind—the best adapted to its purpose—that had then appeared. It was cheap, readable and concise, sufficiently illustrated, and systematically arranged. It contained descriptions of larvæ, pupæ, and perfect insects, with the dates of their appearance and the localities, known to the author, in which they could be found. It also gave the names of the food-plants of the larvæ.

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*Editor of the "Zoologist" and author of the "Insect Hunters," etc.
†Author of "The World of Insects," etc.

In 1859 Dr. Breckenbridge Clemens wrote to Stainton from Easton, Pennsylvania, and said: "With us (in America) everything has yet to be done." He also told of efforts that the authorities of the Smithsonian Institution were about to put forth; and he predicted a bright future for American entomology. His prediction has been amply fulfilled.

In all probability Stainton's work was well known to the founders of our own society which is now in the 38th year of its existence, and which has done so much good. Some of the original members of the society are still among us. Long may they live; and may their influence be felt in ever-widening circles!

I do not doubt that there are many to-day, especially among the young, who are, as yet, mere collectors. They stand, so to speak, within the vestibule of the Palace of Science, and they should receive a hearty welcome, and be encouraged to go forward, for there are noble apartments, well-furnished, open before them, and the farther they go the better they will be entertained.

The collector will soon wish to learn the names of his captures, and then the proper position of each with regard to the others, and so SYSTEMATIC ENTOMOLOGY will engage his attention. I would, therefore, urge parents and teachers to encourage a taste for Natural History in the young people under their care; and I would adopt the words of Warwick James Price and say, Here's to the school-boy—

"Who one day in seven
Slips off to the country to find it a heaven,
And reads in the sunshine, the fields and the brooks,
A wisdom the truest, not printed in books."*

The tyro in entomology in this city has a very great advantage in being able to examine the Society's collections, in which a vast number of our Canadian insects are correctly arranged in their orders, tribes, families and genera, and are beautifully kept by our curator, Mr. Alston Moffat.

But I need not say that the Entomological Society of Ontario has far higher objects in view than those that appertain to RECREATIVE ENTOMOLOGY and SYSTEMATIC ENTOMOLOGY. Let any one examine its thirty-one annual reports, and he will find that what is known as PRACTICAL or ECONOMIC ENTOMOLOGY has received from it a vast amount of attention. It has investigated the habits and traced the life-histories of creatures that affect our growing crops, our stores and home-supplies, our live-stock, and our domestic and personal comfort; and it has spread most valuable information as to the best methods of dealing both with our insect friends and insect foes. There is much that comes under the head of Practical or Economic Entomology to interest us all.

The subject of the Agency of Insects in the Fertilization of Blossoms has been brought before us by such writers as Percy Groom and Grant Allen; and many interesting enquiries in this direction present themselves. For example: How is it that the Quebec farmers have to send elsewhere for their Red Clover Seed? They can grow fine crops of Red Clover hay—why do they not raise the seed? The answer may be given as follows:—

The insect that affects the fertilization of the Red Clover is the Humble Bee. On the approach of Winter all the Humble Bees perish, except one or two impregnated females from every nest. These creep into snug refuges and hibernate. The winters in Quebec are severe, and linger long; and the few Humble Bees that survive them do not commence operations till the very end of May. They have then to form their nests, collect bee-bread, and lay their eggs; and some time elapses before the working-bees begin to appear. Vegetation on the other hand proceeds with astonishing rapidity—with leaps and bounds; and the clover fields are in bloom before there are Humble Bees in sufficient numbers to accomplish the important work designed for them; and so the clover blossoms are, in the main, unfertilized, and afford but little seed. The season is too short to allow the ripening of seed in the rowen or after-math.

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* "The Munsey," July number, 1896.

The Humble Bees are among our best insect friends; and yet how many a farmer on discovering a humble-bees' nest becomes possessed with an insane desire to destroy it.

The rough coats of bees are admirably suited to sweep the pollen from the anthers of flowers, and to convey it from blossom to blossom.

The pollen of plants is in itself well worthy of examination. It presents a remarkable variety both in form and color, as a few descriptions will show:—

The pollen-grains of the Orange Lily are ellipsoid, and of a deep Indian red.

Those of the Sun-flower are globular, and of a golden yellow.

Of Geranium the grains are round, warty and of the color of raw sienna.

Of Malva, the grains are round, set with spines, and of a pearly white.

The Sweet-pea has pollen-grains oblong in outline, and of the colour of amber.

The Petunia has grains egg-shaped and of pale lilac.

The pollen-grains of Mignonette are of a long oval, and are flesh-coloured.

A wide and interesting field for investigation is presented to the Entomologist and Botanist in the subject of the fertilization of blossoms by insect agency.

Scientists have of late made considerable advances into a field which, though not altogether unrecognized, had been but little explored—that of MEDICAL, OR HYGIENIC ENTOMOLOGY. Physicians have long studied that part of it which comes under the head of Dermatology, and have also written much upon internal parasites; but the subject of the spread of disease by the agency of insects has not until lately, entered largely into their studies.

Forty years ago a French-Canadian gentleman told me of a person who had died of "Charbon," resulting from the bite of an insect. He explained to me that the insect had, in all probability, made an attack upon a diseased animal before assailing the man.

In conversation with others, and in the course of years, I have heard of other cases of this *Charbon* or *Anthrax*, produced by insect agency.

That this terrible disease may be readily conveyed to human beings may be learned from the case of Mrs. Mary O'Neill, of Titusville, Pa. She, having washed the soiled linen of her husband who had handled infected hides in a tannery, was taken with anthrax, and died in a few days in great agony.*

The panic that ensued on the spread of the information that several persons had died from the assault of an insect popularly called the "Kissing Bug," viz.: —*Melanolestes picipes*, Herrich-Schæffer, had at least this good effect—it drew the attention of Entomologists more closely to the subject of the spread of disease through insect agency.

Important investigations have been made as to the spread of malaria through the bites of mosquitoes; and the timely publications of Dr. Howard, of Washington, D.C., have thrown much light upon this subject, and given valuable information upon the various kinds of mosquitoes found in North America and their habits. His work (published by McClure, Phillips & Co., New York) should find a place in every Naturalist's library.

The ever-present House-fly, *Musca domestica*, has, under like investigations, risen in public recognition from a merely troublesome household pest, into the "bad eminence" of a possibly dangerous foe. It is found that it is capable of conveying the baccilli of disease from the sick chamber to the kitchen and the dining-room. For valuable information on this point I would refer you to a paper by Dr. Howard in Bulletin No. 30, New Series. U. S. Dep. of Agr.; one by Dr. Smith Ely Jelliffe in "The Munsey" for August of this year, and one by Dr. Fletcher, No. 3, vol. XXXIII of "The Canadian Entomologist."

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*Quebec Morning Chronicle, Sept. 16th, 1901.

We are beset by these insidious foes; and those who tell us of the dangers from them are public benefactors. "To be fore-warned is to be fore-armed."

Flies come from without; and pains should be taken to keep them without—as may be done by the use of gauze blinds and doors. Those that enter should do so to their destruction. Now that the fly-papers known as "Tangle-foot" are so cheap, and so effective, it ought not to be very difficult to keep the house free from flies.

Another subject that should raise the science of Entomology in the estimation of the public is that which may be called COMMERCIAL ENTOMOLOGY. And by this I do not mean the traffic in insects between dealers and collectors; though there are firms both in America and Europe doing a considerable business in this line. I have the price-list of an English firm before me; and it is curious to note the amounts asked, per pair, for some of our Canadian insects:—

For *Papilio Turnus*, 3s. 6d.
Colias Eurytheme, 1s.
Argynnis Atlantis, 5s.
Melitæa Phaeton, 1s.
Hemaris Thysbe, 3s.
Deilephila lineata, 2s.
Sphinx luscitiosa, 8s.
S. drupiferarum, 6s.
Ctenucha Virginica, 3s.
Prionoxystus robiniæ, 10s.

The covers of our Entomological magazines by their advertisements and notices, show that this kind of traffic is widely carried on.

No, I do not refer to this traffic when I speak of *Commercial Entomology*; I refer—

1st, To the unintentional transportation of insects from foreign lands by shipping, and their trans-continental conveyance by train, etc.

2nd, To the importation of insects, and insect productions, as merchandise.

(1) One night, in August last, my business took me along one of the wharves of the Louise Basin at Quebec. On one side of my path was a long store-house; on the other was an ocean steam-ship discharging her cargo. The whole scene was brilliantly lighted with arc lights attached to the building. I paused under one of the lights to notice the water-flies that had been attracted by it. Besides these, there were a few moths and a number of cockroaches (*Blatta orientalis*, Fischer). The last had, I doubt not, come from the ship. And I was reminded by them that their species was brought to England by ships trading to the Levant; and from England they have been sent to many lands. They have of late years become exceedingly numerous in Quebec.

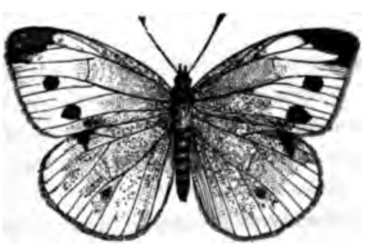

Fig. 3. Cabbage Butterfly (*Pieris rapæ*).

House-flies have been carried in ships even as far as New Zealand; and where flies are found, there we may expect to see spiders. So we do not wonder that Henry Christopher McCook writes:—"Some of our American spider species have been imported from Europe, and I have seen them on vessels stowed away in divers crannies, and under sundry parts of the ship."*

Of imported insects that have made a stir in Canada, the Cabbage Butterfly (Fig. 3), the Larch Saw-fly (Fig. 4), the Mediterranean Flour Moth (Fig. 5) and the San José scale are examples too well known.

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* *Old Farm Fairies.* Appendix, Note C, p. 18.

It is probable that *Zeuzera pyrina*, Fab., (The Leopard Moth), *Porthesia auriflua*, W. V., (The Brown-tail Moth), and *Ocneria dispar*, Linn, (The Gypsy Moth), will some day find their way to Canada, as they have effected a lodgment in the States.

I am sorry to record the advent of the Buffalo Carpet Beetle (*Anthrenus scrophulariæ*, Linn), to the Province of Quebec. I found it last July at Lennoxville and also at Sherbrooke. It had, I suppose, been conveyed to Canada in woollen goods from the United States.

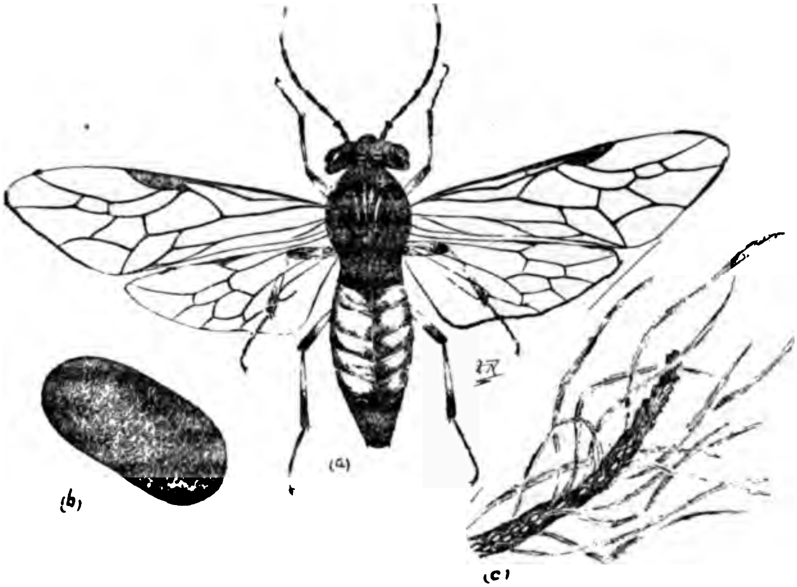

Fig 4. The Larch Saw-fly, cocoon and eggs.

It is worth a degree of attention that we cannot now give, as to whether the set of insect migration was originally from West to East, or from East to West; and how far the great land features of this continent have checked the spread of immigrant species; and to what extent climatic and other influences have affected their form and coloration.

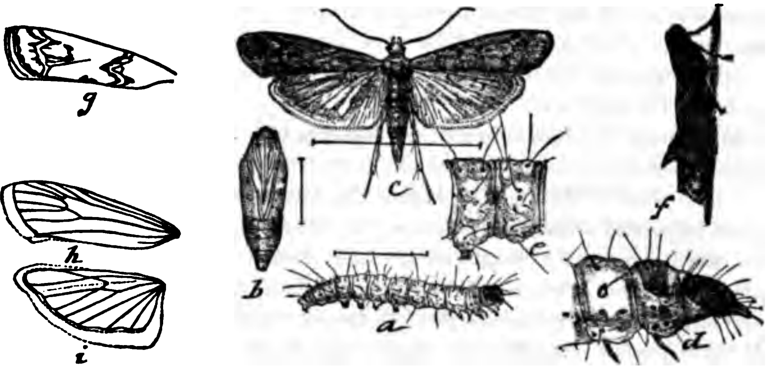

Fig. 5. Mediterranean Flour-Moth.

Some species of our British Columbian insect fauna seem to me to have a much nearer general resemblance to European species, than to those of Eastern Canada and the New England States. For examples:

Parnassius Clodius, Men., has a likeness to *Parnassius Apollo*, Linn.

Anthocharis Ausonides, Bdv., to *Pontia Daplidice*, Fab.

Melitæa rubicunda, H. Ed., to *Melitæa Artemis*, Fab.

Cænonympha inornata, Edw., to *Cænonympha Pamphilus*, Westwood.

Such questions as these might come under the head of GEOGRAPHICAL ENTOMOLOGY.

But it is (2) to the importation of insects and insect productions as merchandise that I would more particularly draw your attention. And first to the importation of silk and silken goods.

The silk manufacture has been carried on in China from time immemorial. Its beginning—like that of the cultivation of grain—has been lost trace of in the lapse of ages. In the third century of the Christian era, silk brought to Europe was of so much value that the Emperor Aurelian (most ungallant of men !) refused his wife a silk dress, on account of the cost.*

In the 6th Century two Eastern monks visited India and acquired a knowledge of silk culture. They secreted eggs of the silk-worm moth in the heads of their walking-sticks, and carried them to Constantinople. In the neighborhood of that city silk-culture was first practised. From thence it spread to Italy, and subsequently to France. On the revocation of the edict of Nantes in 1685, 70,000 Huguenots sought refuge in England and Ireland ; and some of them established the manufacture of silk at Spitalfields and Derby.†

In the days of Queen Elizabeth silk-stockings were a costly luxury ; and it is said that James VI of Scotland, on one occasion, borrowed a pair from the Earl of Mar, that he might present a respectable appearance before the English Ambassador.‡ In the fiscal year ending June 30th, 1899, the people of Canada indulged in silk hosiery to the value of $4,119.

The total value of silk goods imported to Canada in the year mentioned was $3,753,539, on which custom dues amounting to $1,091,218.29 were paid.

Next in importance to the traffic in silk and silken goods comes that in honey and wax.

In Canada itself Bee-culture has been raised to great perfection ; and vast quantities of wax and honey are obtained. But the home supplies are not equal to the demand. And so we find that, in the year mentioned above, 33,564 lbs. of bees-wax were imported from the United States. The value of this was $8,941 ; and upon it $894.10 was paid as duty. Of honey and "imitations thereof" 83,888 lbs. were imported—the value of which was $8,579, and the customs duty $2,482.97.

The importations of honey were of course small to those Provinces in which the home supplies were large, and, *vice versa*, large to those whose home-supplies were small, or altogether wanting. Thus by Ontario 98 lbs. only were imported, while to British Columbia 32,487 lbs. were sent ; and to the Yukon, 49,694 lbs.

Large quantities of wax are used in the manufacture of candles for use in the elaborate ritual of the Roman Catholic Church. I lived for some time near a manufactory of these candles. The yellow wax came in sheets, which were blanched by being spread upon the grass and exposed to the air and the sunshine.

Next in importance to the trade in wax and honey is that in cochineal.

The cochineal insect, *Coccus cacti*, is raised in great numbers in Mexico. It is a suctorial insect, and its food-plant is the Nopal or Indian Fig, *Cactus cochinellifera*. Extensive plantations of cacti, or nopaleries as they are called, are formed on the mountain slopes ; and there the Indians locate, watch over, and at length secure their charge. In appearance the dried insects resemble shrivelled berries, or grain. They are of a mulberry colour, and have a whitish bloom. It takes 70,000 of them to the pound weight. Of the cochineal brought into Canada in the time mentioned, 2,512 lbs. came through Great Britain and 30,675 lbs. through the United States. The value of the whole was $1,708. According to the computation just made 232,309,000 dried Cochineal insects were brought to Canada in the year. The substance called Lac is a production of another Coccus, viz.—*Coccus lacca* which feeds on *Acacia arabica* and other trees. It is a native of India. Insects of the species crowd together, puncture the bark of their food-plant, and gradually become encrusted with a resinous matter which exudes from their bodies. This substance comes to us in its crude state, and also under different forms as shell-lac, button lac, sheet lac, etc. It is used in the composition of varnish, sealing-wax, etc., and in the colour called lac lake. 146 lbs. of lac valued at $29 was brought into the Province of Quebec during the year mentioned, for home consumption.

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* Kirby and Spence's Entomology, Letter X.

† History of Insects, R T.S., p. 153.

‡ Kirby and Spence's Entomology, Letter X.

One other production of insects must be mentioned here namely nut-galls, or Aleppo galls. They are caused by the punctures made by a Cynips, *Diplolepis gallæ-tinctoriæ* ; and they abound throughout Asia Minor. They are gathered by the inhabitants, and exported from Aleppo (hence the name), and other ports of the Levant. They are used for dyeing purposes and in the manufacture of ink. 534 lbs. of these galls were imported to Ontario in the year mentioned, and 13.296 lbs. to Quebec. The whole being valued at $1,065.

The total value of insects and insect productions admitted to Canada in the year ending June 30th, 1899, was $3,773,832, upon which duties amounting to $1,094,595,36 were collected. These figures show the importance to the community at large of what I have called Commercial Entomology.

But there are yet higher lessons to be learned in our consideration of insects than those which have reference to them as they affect our food supplies, health and business interests.

"All Scripture" we have learned "is profitable for doctrine;" and in the "Book of Nature," there are many "parables" which illustrate and enforce Divine truths. The student of well-balanced mind cannot advance far in the study of insects without perceiving that they bear ample testimony to the fact that there is a Divine Intelligence, an all-wise, all powerful and beneficent being who has fitted them to their surroundings; who has numbered their parts, and proportioned them with the utmost exactness; who has made them beautiful in their season; who has foreseen their requirements, and ordered all their ways, and whose goodness is over all His works. Who has, in short, made record of Himself in these, the works of His hands.

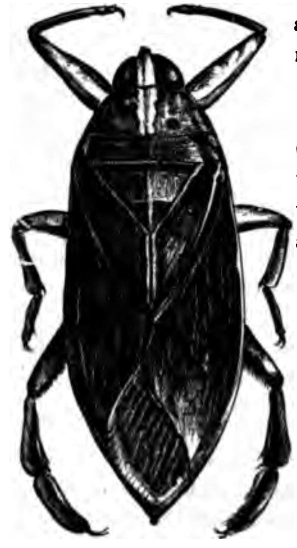

Fig 6. The Giant Water Bug.

(1) God has adapted the insect to its environment.

Take for example the Giant Water Bug, *Belostoma grandis*, (Fig. 6). This creature spends a great part of its existence in the water, but comes forth, in its perfect state, to seek a mate, and to move to other waters. It lives by suction, preying upon fish and other denizens of the pools and streams. It is necessary that it should be able to float on the surface of the water and to dive beneath it; that it should have a quick sight, great powers of motion, a strong grasp, suitable breathing apparatus and mouth-organs, and powerful wings to sustain its large body in its aerial excursions. With all these it is admirably provided.

Its body is the shape of a well-proportioned wherry. Its hind legs are sweeps for propelling it through the water. The fore-legs are grapnels, ending with sharp claws, to enable it to hold itself against a current or to cling to its prey; whilst the middle pair of legs serve to steady it, and also as rudders, to guide its course—the rudders of ships, you will remember were, in early days, placed upon the sides. The eyes of the bug are large and protuberant. The cornea is made up of a vast number of facets, which are hexagonal, and beautifully regular, both in size and shape. The proboscis of the insect is protected by a sheath or cover. The instrument itself is brown. and polished, and comes to a sharp point. Around the edge of the insect's abdomen, under its close-fitting wings, there is a smooth channel, though all the rest of the upper side of the abdomen is covered with a thick brown pile, like that of plush. This channel is probably a receptacle for a supply of air, for use when the insect takes a plunge into the depths.

Who fitted the water-bug to the part it has to play? It did not fit itself. Man could not do so, any more than he, by taking thought, could add one cubit to his stature, or make one hair white or black. Did Nature? No—we do not deify Nature. There is a Divine Being who originated and controls natural forces—who designed this creature, so admirable in every part.

(1) The exactitude with which every species of insect is formed excites our admiration.

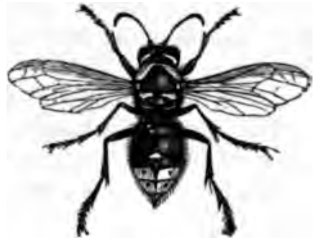

Fig. 7. A Wasp (*Vespa maculata*)

Consider the wasp (Fig 7). The male has 13 joints in the antenna: the female has 12—neither more nor less in either case. The male has invariably 7 segments in the abdomen, and the female 6. Then, moreover, the limbs of the wasp consist of five parts—coxa, trocanter, femur, tibia and tarsus; and in the tarsus there are five joints. Who counted out these things and fixed the rule? Who traced out the lines and spaces in the wings, so exactly that the species of the insect may be told from the wings alone? The same God of whom David wrote :—

"Thine eyes did see my substance yet being unperfect; and in Thy book all my members were written which in continuance were fashioned when as yet there were none of them." Ps. CXXXIX, 16.

The God who counts and measures.

Who taught *Vespa Maculata* Linn. to build its wonderful nest of wood-pulp; and gave it the geometrical and mechanical skill to form its hexagonal cells (Fig. 8), and suspend them, tier below tier, in such a marvellous way?

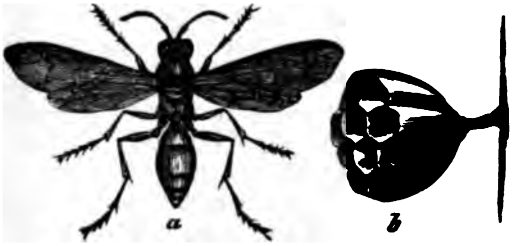

Fig. 8. Wasp (*Polistes*) and its Comb.

The same God, "Who hath measured the waters in the hollow of His hand, and meted out heaven with the span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance." Is. XL. 12.

(3) What exquisite beauty does the insect world display to the admiring gaze of men. Who was it gave to *Philosamia Cynthia* its lovely dress of fawn colour embellished with delicate mauve, and ornamented with the pale lunettes to which it owes its name?

And who gave to *Phlegethontius cingulata* its wonderful gradations of colouring—its rings and vandykes, its bars of black and carmine, and its white-spotted borders? It was that Beneficent Being who delights in beauty and grace, who in love to His creatures has made all nature—

"Beauty to the eye,
And music to the ear."

(4) In 1873, before the moth *Cossus Centerensis* had been named and described by Dr. Lintner, I found protruding from the trunks of Balsam Poplars growing on the banks of the Yamaska River a number of empty chrysalis cases of this species. I examined the bolls of the trees carefully and was rewarded by finding a fine female of the moth. I was not then sufficiently acquainted with the Cossidæ to know that this belonged to a new species I then peeled away some of the bark from one of the trees and found the mouth of a tunnel—over this I fastened a piece of netting—so as to form a bag; and, by this means, I secured a male of the species. I have the pair in my collection still.

Cossus Centerensis lays an egg in a crevice of the bark of a tree. The little caterpillar that *comes from* it bites its way into the wood. Its tunnel is at first a mere pin-hole, and is soon closed by the *frass* it leaves behind it. As the larva grows it enlarges its tunnel till at length its instinct warns it to work upward and outward. This it does till it leaves only a film of bark between it and the outer air. It then retires some inches down its tunnel so as to be out of the reach of the sharp bill and long tongue of the wood-pecker. There it assumes its pupal form. When the time for the imago to appear approaches how can the footless chrysalis ascend its shaft and push its way through the screen of bark? Ah, that difficulty has been foreknown and provided against by Him, "who sees the end from the beginning." Around every abdominal segment of the chrysalis there are teeth or serrations in due order, which enable the chrysalis to secure a hold on the sides of its tunnel, to work its way up and to give it a purchase so that it can break through the closure of bark. It extrudes its body till the wing-cases are free, and then its skin is rent and the moth escapes.

Man learns by observation, experience and communication with his fellows, and provides against possible contingencies, but this creature, up to the time it leaves the chrysalis, has had no intercourse with its kind—has led a solitary existence, pursuing the course marked out for it. It has been ignorant of its future. It could not of itself provide either against danger or change. But its course, its wants, the means for its security and comfort, its entrance upon a higher existence, all these on the dawn of creation—

"Hid in God's foreknowledge lay."

The Grand Architect of the universe made careful and exact provision for the creatures of His hand.

The science of entomology abounds in lessons. To the consideration of the lovers of beautiful objects, of the young, of pleasure-seekers; of gardeners, fruit-growers and farmers; of merchants, store-keepers and house-keepers; of physicians, pastors and teachers; of thoughtful and pious men and women everywhere, I commend it. *It is of importance to the community at large.*

THE CHAIRMAN, Hon. J. Dryden, expressed the pleasure with which he, and he was sure all present, had listened to Dr. Fyles's interesting and instructive address. He then spoke of the powers of observation with which everyone is endowed, and impressed upon all the importance of cultivating this faculty to the utmost and obtaining the valuable results which would follow from doing so.

DR. JAMES FLETCHER, of Ottawa, Dominion Entomologist and Botanist, was next called upon to address the meeting. He spoke of "The Value of Nature Study in Education," and held the close attention of the audience during his half hour's address, of which the following is a brief outline:—"Nature Study," he said, was a very simple matter, but one which was often misunderstood. It was not a study of natural history but a training to enable us to observe and understand, as far as possible, everything that comes before us. It teaches a child to notice the common objects about it and to see far more than it otherwise would. The addition of the study of natural objects to the school and college curriculum would exercise a very useful and important influence. True education is the drawing out of the faculties to enable the child, when grown up, to use its mental powers fully and properly; nature study does this and is therefore the common sense of education, for it teaches a child not only to see but also to think. He then described how bad boys in school may be improved. They are generally active and restless, wanting something to interest them and to use their faculties upon; but get them to join in investigating some of the lovely natural objects about them, no matter how common they may be, and a bond of sympathy with the teacher is at once created and their restless spirits find something to expend themselves upon.

Some of the benefits of Nature study are that it compels people to realize that everything in a state of nature is absolutely perfect and beautiful; it leads the student to become habitually neat and methodical in all his work; it promotes habits of care and accuracy; it insists up-all observations being absolutely truthful; it inculcates a spirit of reverence and tends to make better men and women. Not only in the æsthetic side, but also in the economic and practical side is its study valuable, for it must be of great use to know what insects are beneficial, and which injurious, and what plants are noxious weeds to be got rid of or useful for some special purpose. In Manitoba a practical instance of the value of Nature study can be found. There the children are taught in the schools to know the common weeds and plants of the country. In every school thirty of the commonest plants to be found on the neighbouring farms are brought in for study, and these necessarily include several weeds. The children are taught that there are three kinds of plants, those that live one year, two years or many years and that of the last kind there are two classes—the deep and the shallow rooted; that plants, like animals, must eat and drink, and that they do so by means of their roots; and therefore, that if the roots are exposed to the sun and wind they starve and die. The result already is that the most troublesome weeds are known and recognized throughout the length and breadth of the Province, and the farms are now much cleaner than they formerly were. Some such plan ought to be adopted here, and great benefits would, in a few years, result from it. The attention of our children should be directed, not only to plants but to birds, insects, wild animals, anything in a state of nature that may be found in their own neighbourhood.

Dr. **Fletcher** then spoke in warm terms of the great blessings we enjoyed in this Province, the excellence of our climate, the fertility of our soil, our freedom from devastating cyclones, the absence of serious epidemics, our admirable liberty with just laws to punish the evil doer, and then drew the moral that we should use every effort to train up our children to be worthy of such an inheritance, and to be fitted for the development and utilization of all our splendid resources.

He then delighted the audience by an exhibition of lantern slides of plants, insects, and other natural objects, respecting each of which he gave clear and concise explanations as they were thrown upon the screen. The following are some of the objects exhibited: Plant lice, canker worms, codling moth, scale insects, cabbage butterfly, spruce gall louse, horse bot-fly. sheep tick, luna moth, walking stick insects, pollen, leaf of deutzia, sections of pine, hollow and solid wheat stems, lilac buds and stems, and a stem of corn, yellow columbine, the sundew, Venus's fly-trap, etc.

A cordial vote of thanks was then moved by Mr. J. H. Bowman, seconded by Rev Dr. Bethune, to the Hon. J. Dryden for his kindness in presiding over the meeting; to Dr. Fyles and Dr. Fletcher for their interesting addresses, and to Principal Merchant for the use of the room, and his valuable services in providing the lantern, and with Mr. Rennie's assistance, manipulating the slides.

The Hon. Mr. **Dryden**, in acknowledging the vote of thanks, said that he had been much benefitted by his visit. His Department and the Entomological Society went hand in hand for the country's good, and each recognized the value of the union; he hoped that their mutual interest would never flag.

The meeting then adjourned.

THURSDAY, NOVEMBER 14th, 1901.

The Entomological Society resumed its sessions at 11 a.m., the President, Rev. Dr. Fyles, in the chair. The first order of business was the reading of the Director's Reports on the Insects of the year, which were followed by remarks and discussions participated in by several of the members. After the Report of the Council had been read, the meeting proceeded to the election of officers for the ensuing year, which resulted as shown on page 2. The reports of the various branches, sections, and officers were read and approved.

In the afternoon a number of valuable and interesting papers were presented, some of them from want of time being read by title only; rare and beautiful specimens were exhibited; many notes and observations were recounted, and when the hour of parting arrived (about 5.30 p.m.) general regret was felt that the sessions could not be continued for another day. All who were present enjoyed the meetings very much, and realized how full of value as well as of pleasure such gatherings are, when men of similar tastes can meet and discuss subjects that to them are of exceeding interest.

The following exhibits were shown by Dr. Fletcher :—A case illustrating the method which had been adopted in the arrangement of the cabinets of injurious insects at Ottawa. Several of the more important injurious insects of the year were shown in all their stages together with some of their parasites.

In two cases mounted specimens were shown of rare or interesting species, amongst these may be mentioned two specimens of *Sphinx Canadensis* taken at Ottawa by Mr. Arthur Gibson. This species bear a somewhat close resemblance to *Sphinx chersis* but has a general tinge of brown over the whole body, as well as different ornamentation on the wings and thorax. *Sphinx Vancouverensis* from Rev. G. W. Taylor, collected at Gabriola Island, B.C.

Heterocampa biundata—a very large and handsome specimen, collected at Ottawa in the middle of June.

H. marthesia—a perfect specimen reared from a larva found at Ottawa in 1900.

Homohadena badistriga—in all stages.

Mamestra atlantica—in all stages.

M. adjuncta—moth and larva.

Datana integerrima—larvae and moths.

Arctia virgo—showing larva with dorsal stripe.

Arctia arge— larva, from D. Brainerd, Montreal.

Alypia MacCullochii—moth and larva, collected at Banff, N. W. T.

Gluphisia severa—larvæ in all stages, and moths. Eggs received from Mr. J. W. Cockle, Kaslo, B. C.

Leucobrephos Middendorfi—2 perfect specimens received from Mr. Norman Criddle, of Aweme, Man.

Arctia phalerata—in all stages showing varieties, including females with yellow underwings.

Nemeophila Selwyni—bred from eggs collected at Nepigon, Ont.

Peridroma astricta—moths and the very beautiful larva reared from eggs sent from Kaslo, B. C., by Mr. J. W. Cockle.

Smerinthus ophthalmicus—in all stages from the egg to adult—reared from eggs sent by Mr. J. W. Cockle.

Arctia virguncula—in all stages reared from eggs sent by Mr. A. Kwiat, of Chicago.

Several beautiful specimens of Hydroecias and their work were exhibited. The larvae of these were sent to the Division of Insects by Mr. Henry Bird of Rye, New York, and beautiful specimens for the cabinet were reared and exhibited of the following species : *H. cerussata*, *H. necopina*, *H. marginidens* and *H. impecuniosa*. *H. cataphracta* was bred from Ottawa material, as well as *Achatodes zeæ* in considerable numbers, from the young stems of wild and cultivated elders (Sambucus).

The most interesting butterflies shown were *Erebia Vidleri*, from Mount Cheam, B.C.; *E. Rossii*, from Telon River, Y.T.; a specimen of *Pieris protodice* from Ottawa, and a very handsome specimen of the variety *Lintneri* of *Vanessa antiopa* in which the marginal band is ⅝ of an inch wide at the widest part.

NOTES ON INSECTS OF THE YEAR.

Division No. I.—Ottawa District.—By C. H. Young, Hurdman's Bridge.

When Dr. Fletcher informed me on his return from the annual meeting of the Society in November of last year that I had been elected Director for the Ottawa district, I indeed felt greatly honoured at being appointed a member of the Council of such an important Society.

I regret however that owing to the remarkable absence, from a general standpoint, of all kinds of insects during the past season, that I was unable to make as many observations as I had hoped.

Tent caterpillars which had been so prevalent and destructive of late years in the Ottawa district were very scarce, and although I was on the look out for them, I failed to locate more than one nest—this on a wild plum tree.

The most abundant pest was the White Cabbage Butterfly (fig. 9), which occurred in remarkable numbers near my farm. In fact they were so prevalent at the end of June that they gave a decidedly white appearance to the fields when flying: as if a heavy fall of snow was in progress, or as if many people had torn up handfuls of small pieces of white paper and scattered them at the same time through the air. One of my neighbours had a great quantity of wild mustard growing in his fields, and the larvae were very abundant on these plants, and ate everything except the stems and flowers. They were, of course, very destructive to cabbages, and as soon as my neighbor set out his young plants the female butterflies immediately began to lay eggs on them, which in due course hatched, and the larvae quickly devoured the foliage. I advised my friend in time to dust his plants with pyrethrum insect powder, but as he considered that this was too expensive an operation he did not do anything and as a result lost all his plants. In August the larvae of the later brood were also very prevalent on turnips. I examined numbers of plants and was pleased to notice that a bacterial disease was at work among the larvae, most of them were dead and in a putrid condition.

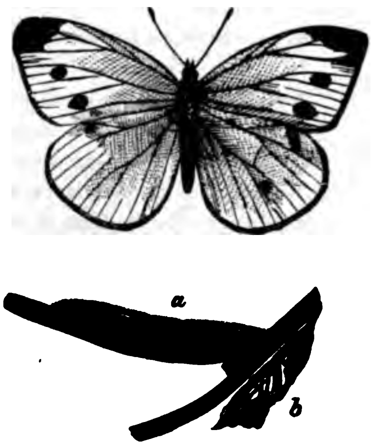

Fig. 9. White cabbage butterfly—*a*, larva; *b*. chrysalis.

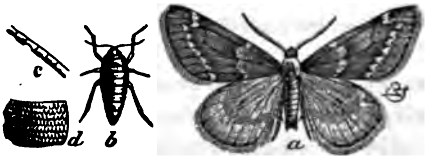

Fig. 10. Canker-worm—*a*, male moth; *b*, female.

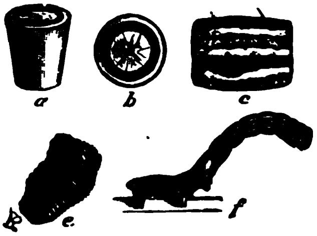

Fig. 11. Canker-worm, eggs and larva.

In the spring of the year Canker-worm larvae (*Anisopteryx pometaria*) (figs. 10 and 11) were very abundant, especially on forest trees. Basswood and beech seemed to suffer most as far as I observed.

From about the middle of August until the early part of September Birch trees of all kinds were badly attacked by the larvae of the Birch Bucculatrix (*Bucculatrix Canadensisella.*) (Fig. 12 shows an allied species which attacks apple-trees.) This attack caused widespread attention and as the larvae were so abundant they soon stripped the trees of their foliage. Towards the end of August the attack was most noticeable, and at this time the leaves were quickly falling from the trees.

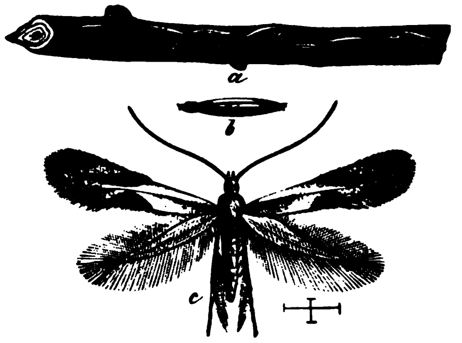

Fig. 12. The apple Bucculatrix (*B. pomifoliella*)—*a*, cocoons on a twig; *b*, a single cocoon; *c*, the moth, greatly magnified.

From the collector's standpoint insects were very scarce in this district during the past season. I, therefore, did not succeed in taking many species which call for special mention. I have during the year continued my work at breeding and inflating larvæ, and the following, which are shown in a case I have brought to the meeting, are some of the species I have raised or collected the larvæ of:—

Papilio turnus—larva, chrysalis and imago; common.

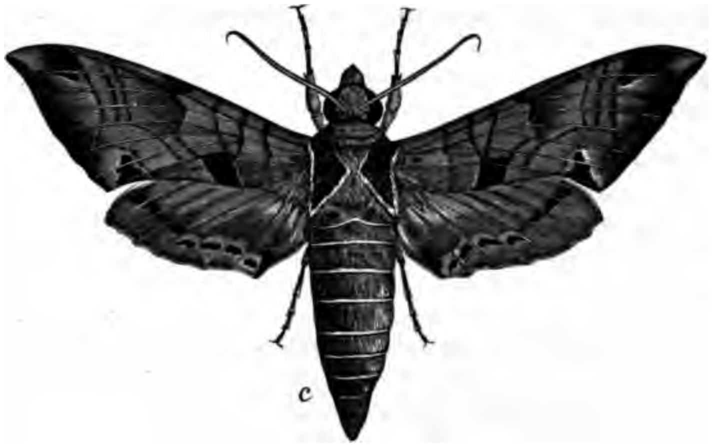

Fig. 13. Philampelus achemon—moth.

Grapta comma—dark and light forms of larva, chrysalis and imagoes. Larvæ were rather common this year on hop.

Philampelus achemon—larva (fig. 14), pupa and imago (fig. 13). This year I collected about 11 larvae on wild Virginian Creeper.

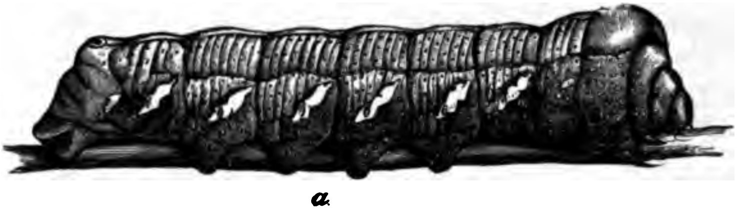

Fig. 14. Philampelus achemon—larva.

Deilephila chamænerii—larva, pupa and imago. Larvae bred from eggs.

Ampelophaga myron—larva, pupa and imago—Larvae uncommon at Ottawa as a rule.

Euprepia caja, var. *Americana*—larva and imago—species rather rare at Ottawa.

Arctia arge—larva and imago—very rare at Ottawa.

Orgyia leucostigma—larva and imago—bred from eggs collected at Toronto.

Parorgyia Clintonii—larva and imago—uncommon at Ottawa.

Euchaetes egle—larva and imago—larvae sometimes abundant on Asclepias.

Semiophora Youngii, Sm. This is a very beautiful Agrotid, the moths of which have been taken on the Mer Bleue, an extensive peat bog near Ottawa, during the past two seasons, and of which several specimens of the larvae were taken nearly full grown at the end of May, 1901, feeding on spruce and American Larch. Larvæ, pupae and imagoes. For a description of this new species see "Canadian Entomologist," vol. xxxiv, page 29, (February 1902).

Arsilonche albovenosa—larva, pupa, imago and parasites. Larvæ common at Ottawa.

Noctua bicarnea—larva and imago—common.

Noctua baja—larva and imago—common.

Noctua clandestina—larva and imago—common.

Mamestra lorea—larva and imago—larvæ common in spring under bark, etc. on the ground.

Hyppa xylinoides—larva and imago—rather common.

Homohadena badistriga—larva and imago—larvæ found on wild honeysuckle.

Abrostola urentis—larva and imago—larvae collected on nettle.

Alaria florida—larva and imago—larvæ occasionally abundant in seed pods of Common Evening Primrose.

Nomophila noctuella—larva and imago—common.

Balsa malana—larva and imago—larvæ on apple.

DIVISION NO. 2.—BAY OF QUINTE.—BY J. D. EVANS, TRENTON.

During the past season very few cases of depredations by insects have come to the writer's notice. *Clisiocampa disstria*, which have been so very destructive in the recent past, were not observable this year, or were so few in numbers as to cause little serious injury.

The only noteworthy instance of a serious attack was that of *Lecanium Fitchi*, the bark louse, on the long blackberry; they were first observed on the 14th of June. On the 20th, six days following, samples of the canes were brought to the writer by Mr. W. A. Warner; he stated that he had half an acre of these berries, and his neighbours, a Mr. Arnott had about six acres and a Mr. Higgins 2 acres; these gardens are situated about two or three miles to the north west of the Town of Trenton. The canes, he said, were literally covered with these insects from a height of twelve or eighteen inches above the ground to the top; in one instance upwards of 150 were crowded within a space of seven inches on the stem. Bordeaux mixture and whale-oil soap emulsion had been applied but apparently with very little beneficial result. Upon making further enquiries and a personal inspection it was learned that Mr. Arnott was the principal sufferer, the others having very few, if any, of the unwelcome visitors. Several samples of these infested canes were forwarded to Dr. Fletcher of the Central Experimental Farm.

Upon examination with a lens it was seen that the majority of the shells, or cases, were filled with an immense number of eggs of a whitish color, and a few of the cases were tenanted with the larvæ of some insect. At this time the fruit was forming but before it ripened, the canes were swarming with the newly-hatched young, they however vanished without doing any appreciably serious injury to the fruit. After the fruit had been gathered the majority of the old canes were cut down and destroyed by fire; in a small patch near the dwelling house, however, the old canes had not been cut down and when on the sixth of the present month, (November,) the writer again visited this garden the new canes were found to be infested, but to a much less degree than the past season's bearing canes.

In June last, the writer placed two of the infested stems in a glass jar, covered with muslin, and awaited developments. About the 1st of July, the eggs began to hatch out and the young appeared in great numbers, about the same time there also appeared three species of Chalcis flies, the larger species appeared first and numbered fifteen specimens in all; then followed two other species much smaller in size of which there were forty-five specimens of one, and twenty-three of the other. No more of them making their appearance, after a few days, the jar was put to one side and overlooked for a time; however, on the 11th of August, other prisoners were observed the majority of them being dead but in two or three instances they were alive; these proved to be *Hyperaspis* four males and seven females of *proba* and one female of *signata*.

When examining the canes on the sixth inst. in Mr. Arnott's garden, it was noticed that some of them presented a peculiar appearance from the ground upwards, as if they were covered with a white fungus, upon close inspection they were seen to be scale insects of a species unknown to the writer, samples of which are herewith presented.

Since presenting the foregoing report Dr. Fletcher has very kindly obtained the names of the parasites, etc.

The small white scale above referred to, found on the blackberry, is the Rose scale (*Aulacaspis rosæ*, Bouché, sometimes called *Diaspis rosæ*). Dr. Fletcher remarks that this is a very bad pest.

The parasitic flies have been identified at Washington, D.C., as follows: No. 1, *Encyrtus (Comys) fuscus*, How. No. 2, *Aphycus annulipes*, Ashm. No. 3, *Blastothrix* sp.

The following additional species were obtained from the blackberry canes sent from Trenton to Ottawa. No. 4, *Microterys*, sp. male. No. 5, *Coccophagus flavoscutellum*, Ashm. No. 7, *Eustochus xanthothorax*, Ashm. Dr. Fletcher says of this last, "a Mymarid described 15 years ago in Can. Ent. vol. 19, 1887, p. 193. This is an exceedingly minute creature which Mr. Guignard found in sorting out the material" and as reported by Mr. Ashmead, "it is the second specimen seen."

The fungus found infesting the Lecanium Prof. Roland Thaxter says "is evidently an immature *Cordiceps* of some sort, I thought at first *C. clavulata*, but the conidia are not those of that species."

DIVISION NO. 4.—HAMILTON DISTRICT.—BY JAMES JOHNSTON, BARTONVILLE.

We have had two very troublesome insects in this district this season, the Hessian fly (*Cecidomyia destructor* Say.) and the potato beetle (*Doryphora 10-lineata* Say).

The work of the Hessian fly was so great as to entirely ruin whole fields of wheat. I have seen fields that looked well and promising last fall and in the early spring so badly ruined as to render them not worthy of being harvested. The early sown fields were where the flies seemed to work the most destruction. The folks on this farm were so discouraged that they have sown rye instead of wheat this fall as a means of checking them.

About the beginning of June the general complaint was about the ravages of the potato beetles amongst the tomato plants. During my experience this has been a record year for these pests. One morning in early June four of us started to put out tomato plants where no beetles were to be seen, but after dinner they were so numerous on the plants set out that we had to leave off planting and turn to hand-picking the beetles. We found from one to thirty-seven on individual plants, so that an idea can be formed of our task of going over 18,000 plants, a task that had to be repeated for several days. If they would show themselves our work would not be so extensive, but the plagued things hide themselves away under lumps of earth when not feeding, so that it is necessary to be daily on the lookout for them.

The following are the only insects new to this district that I have to report for this year:—

As early as February a specimen of *Anthrenus scrophulariae*, Linn., was brought to me from a neighbor's house and later on I came across several.

Sept 28th *Crioceris asparagi*, Linn., (Fig. 15) made its first appearance on our asparagus, when I secured six specimens.

Oct. 10th I took a fine fresh specimen of *Pyrgus tessellata*, Scud. (Fig. 16). Saw another the week previous but failed to secure it.

In the discussion which followed upon the reading of the Directors reports, Dr. Fletcher referred to the little black Lady-beetle, *Pentilia misella*, in Canadian orchards, and said that while it is an object of great interest from its habit of preying upon the San José scale, it cannot be relied upon as of any great value for the destruction of the scale. It is still absolutely necessary to apply practical remedies and not wait for this little insect to perform the work.

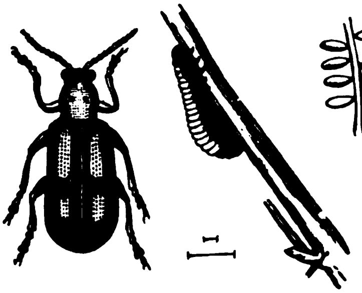

Fig. 15. Asparagus beetle, larva and eggs.

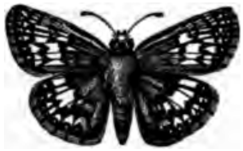

Fig. 16. Pyrgus tessellata.

PROF. WEBSTER said that the *Pentilia* was increasing in abundance in Ohio, but only late in the fall did it become numerous ; the winter following reduced its numbers to such an extent that it took all the next season for it to recover its numbers, and consequently it was not of much help as a remedy for the scale. The Colorado potato beetle had been very bad on tomatoes in Ohio this year

DR. FLETCHER said that it had also attacked tobacco grown in gardens at Ottawa. In speaking of the cabbage butterfly he recommended the Pyrethrum insect powder as the best means for destroying the larvæ ; it would be much too dangerous to apply Paris green to a vegetable that was afterwards to be brought to table.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its Annual Report for the year 1900-1901.

The thirty-seventh annual meeting was held in London in November, 1900, and was well attended both by resident members and those from a distance. On the first evening a joint meeting was held with the Horticultural Society in a lecture room at the Normal School. The chair was taken by Prof. C. C. James, Deputy Minister of Agriculture for Ontario, who delivered an interesting address on the value of horticulture in its various aspects and its intimate relation with Entomology. Mr. W. E. Saunders followed with a paper on "The planting, care and pruning of the trees in the parks and streets of the city," and Dr. James Fletcher gave an address, illustrated with lantern pictures, on trees and their methods of growth and on some especially injurious insects. The two following days were occupied with the reading of papers and reports, a discussion on the San José scale and the transaction of the business of the Society. A full account of the proceedings has been published and distributed.

The thirty-first Annual Report on Economic and General Entomology was presented to the Minister of Agriculture for Ontario in December last and was issued from the press in the following February. It contained 112 pages and was illustrated with forty-six figures in the text and a photogravure portrait of Mr. J. Alston Moffat, who has been the efficient curator and librarian of the Society for upwards of ten years. In addition to an account of the proceedings at the annual meeting, it included among many useful and practical papers the President's address by the Rev. Dr. Fyles, in which he described the importance of insects in the fertilization of plants ; papers by Prof. F. M. Webster on the codling-moth, the use of crude petroleum against scale insects, some species of Dermestidæ and two longicorn beetles affecting nursery stock ; by Prof. W. Lochhead on forest insects, the San José scale, the squash bug, and the silk industry in Ontario ; by Mr. Moffat on Anosia Archippus and Parasites in the eggs of Chrysopa ; by Dr. Fyles on the Dragon flies of Quebec ; by Dr. Fletcher on the injurious insects of 1900 in Ontario ; notes on insects of the year by the Directors, Messrs. Evans, Cox, Johnston and Rennie, and by Mr. Moffat ; and papers by Messrs. Gibson, Gregson, Nash and Dearness. An abstract was given of the proceedings at the annual meeting of the Association of Economic Entomologists, and a short report of the second annual meeting of the North-west (Canada) Entomological Society.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 32nd volume was completed in December last ; it consisted of 337 pages, illustrated with thirty-three figures from original drawings and seven full-page plates. The contributors numbered sixty-four and included well-known Entomologists in Great Britain, Germany, Switzerland, South Africa, Brazil and Mexico, as well as in the United States and Canada. The 33rd volume will be completed next month ; the eleven numbers thus far issued contain 316 pages and several original illustrations.

The Index to the thirty annual Reports of the Society, 1870 to 1899, was published in January last, and is for sale at a nominal price. To those who have occasion to refer to the Reports it must be of very great value.

Meetings for the study of Entomology were held during the winter, the order Coleoptera being taken as the portion for consideration. The Geological and Ornithological Sections have held regular meetings throughout the year, the Microscopical Section during the winter months, after which the Botanical Section took its place. Public lectures of a popular character were given by Dr. Bethune on Entomological subjects before the London Horticultural Society, the Canadian Horticultural Association, and the Young People's Societies connected with the Bishop Cronyn Memorial Church and the South Wellington Street Methodist Church. Mr. W. E. Saunders also delivered lectures on the Birds of Canada, illustrated with lantern pictures, at the High School, Montreal, and before several teachers' meetings and church societies. One field meeting was held at Komoka on the 13th of July, and a goodly number of botanical and entomological specimens were obtained.

The Council desires to place on record its high appreciation of the services of Mr. J. A. Balkwill, who has filled the office of honorary treasurer for the last nine years and has now found himself unable to continue in the position. His books have been kept with great neatness and accuracy, and his attention to the business of the Society has always been prompt and satisfactory. Thanks are also due to Mr. Moffat, the Curator and Librarian, who has been indefatigable in his care of the library and collections, and has shown a constant zeal and interest in the welfare of the Society.

The Council here places on record its great appreciation of the scholarly and valuable work of the Editor of *The Canadian Entomologist*, the Rev. Dr. Bethune, who during the last thirty-eight years has been doing useful service for the advancement of entomology, not only in Canada but throughout North America.

The Council, in common with entomologists everywhere, deeply deplores the loss of Miss Eleanor A. Ormerod, one of our honorary members, who died on the 11th of May last. Her work in economic entomology has proved most valuable to husbandmen, gardeners and others in Great Britain and of much interest to scientific students in all lands.

All of which is respectfully submitted.

THOMAS W. FYLES, President.

REPORT OF THE MONTREAL BRANCH.

The 232nd regular and 28th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held at the residence of Mr. A. F. Winn, 58 Bruce avenue, Westmount, on the 14th of May, at 8.30 p.m. The members present comprised Messrs. A. F. Winn (President), Dwight Brainerd, G. Chagnon, M. W. Davis, J. B. A. L. Leymarie, Henry H. Lyman, G. A. Moore, A. E. Norris, C. Stevenson, and L. Gibb.

The chair was taken by the President, and the minutes of the previous meeting and the last annual meeting were read and confirmed.

The President then submitted the following report of the Council for the past year :—

Your Council have pleasure in presenting the following report of the Society's work during the season 1900-1901 :

Eight regular monthly meetings have been held, the average attendance being ten.

A field day was held at St. Hilaire, on May 24th, which was a very successful and enjoyable outing.

The following papers were read at the meetings :—

Life History of *Euchætes Oregonensis*	Henry H. Lyman.
Note on the Emergence of a Gall Insect	A. F. Winn.
Notes on the Past Season (1900)	A. E. Norris.
Methods of collecting Lepidoptera	H. H. Newcomb.
Notes on Walker's Types of *Spilosoma congrua*	H. H. Lyman.
Danais Archippus	J. B. Williams.
A Fortnight at Biddeford, Maine	A. F. Winn.
Ephestia Kuhniella	Dwight Brainerd.
Notes on Hybridity of Lepidoptera, Papers by Miss Morton, Newburgh, N.J., and H. H. Newcomb, Boston, read by the President.	
Notes on the Larvæ of *Scopelosoma Morrisoni S. tristigmata*, and Description of the Larvæ of *S. Graefiana*	H. H. Lyman.
Entomological Chemistry	C. Stevenson.
Life History of *Vanessa Antiopa*	A. E. Norris.
Commercial Entomology	C. Stevenson.
A Query Regarding the Death of Insects	A. F. Winn.
Pædisca Scudderiana	Dwight Brainerd.
Notes on *D. archippus*	H. H. Lyman.
Among the Lycænæ in England	L. Gibb.

Two new members, Messrs. J. B. A. L. Leymarie and E. Denny, have been added to our roll, but we have also lost, through the sudden death of Mr. E. T. Chambers, one of our most regular attendants at the meetings. Mr. I. B. Williams has moved to Toronto where he will, doubtless, join the Toronto branch. Dr. Wyatt Johnston and H. N. Cowan have resigned.

The book-case ordered for us is in place in the library of the Natural History Society : the few books in it will form a nucleus for a future collection of literature on our favourite subject.

The subject of the formation of a general collection of insects for our Branch was given a good deal of time and attention, and it was unanimously decided to make a beginning. A dozen drawers and a case of sufficient size to contain thirty have been ordered, and we hoped to have had the cabinet ready for donations before to-night's meeting ; such would have been the case but for the death of Mr. Priddy of Toronto, who had the order.

The work on this case is being completed and word of its shipment is expected any day. The members are especially requested to do their best to make the collection as perfect and useful as possible. Through the kindness of Miss Morton we have already received a fine collection of Hybrid Attaci.

The report of the Treasurer submitted herewith shows that we still have a considerable balance to our credit.

Respectfully submitted on behalf of the Council.

(Signed) A. F. WINN,
President.

The Librarian then made his report, and it was moved by Mr. Charles Stevenson, seconded by Mr. G. A. Moore, that the reports of the Council, Treasurer, and Librarian, be received and adopted. Carried.

The Treasurer submitted his report, shewing a balance on hand of $48.90.

The President then read his annual address.

The following officers were elected for the ensuing year ;—

President	G. Chagnon.
Vice-President	C. Stevenson.
Librarian and Curator	A E. Norris.
Treasurer and Secretary	G. A. Moore.
Council	Henry H. Lyman. A. F. Winn. Dwight Brainerd.

Moved by Mr. A. E. Norris, seconded by Mr. C. Stevenson, that a regular meeting be held in June this year.

Moved by Mr. G. A. Moore, seconded by Mr. J. B. A. L. Leymarie, that a field day be held at Beloeil on the 24th inst. Carried.

Mr. A. F. Winn moved, seconded by Mr. M. W. Davis, that a committee on outings for the summer be formed to consist of Messrs. G. Chagnon, C. Stevenson, and A. F. Winn. Carried.

Mr. L. Gibb exhibited a number of Lepidoptera collected in the Yukon in the season of 1900.

After the examination of specimens and discussion, the meeting adjourned.

G. A. MOORE,
Secretary.

REPORT OF THE QUEBEC BRANCH.

At an adjourned meeting held at "Darnoc," the residence of James Geggie, Esq., on the 22nd June, 1901, the President gave an address, the Report of the Council was made, and the officers for the current year were chosen, as follows :

PRESIDENT'S ADDRESS.

We have now entered upon the fifth year of our Association as a branch of the Entomological Society of Ontario.

Since the formation of the Branch we have had many happy gatherings in which conversations have been held and papers read upon the subject of animal and vegetable life and upon the beauties and wonders displayed in the natural objects around us. We have, moreover, enjoyed much social intercourse and many delightful visits to places of interest in the neighborhood of Quebec. Not a few choice specimens of natural objects have been taken by our collectors.

It is hoped that the season we have now entered upon will be as fruitful in pleasant associations as those that have gone before, and that our Branch will continue to flourish.

Among the subjects that during the past year have engaged the attention of practical entomologists have been :—

1. The increased destructiveness of, and the preventives against, that most injurious creature, the San José scale. Professor Lochhead, of the Ontario Agricultural College, has issued a valuable paper upon this pest.

2. Much thought and ability have been brought to bear by Dr. Howard, of Washington, upon the mosquitoes and the danger that exists of the conveyance of disease by them from fever patients to healthy persons. The subject is one of very grave importance.

3. The subject of the Green Pea Aphis was brought under the notice of the members of the Entomological Association at its last annual meeting by Dr. Fletcher. The Green Pea Aphis is a pest that is doing much damage to the pea crops. It has been found destructive along the Atlantic coast, in some of the Western States and in parts of Canada. Several references to it are to be found in the Society's last annual report and will be found interesting.

4. The question as to the practicability of the cultivation of silk in this country has been considered. Professor Lochhead has looked carefully into the subject and has come to the conclusion that, although the climate of Ontario is suitable for silk-culture, and the Osage-Orange, a fitting food-plant for the silk-worm, can be freely grown, there is one great preventive to the introduction of the industry, viz., the lack of cheap labour. This is such that it is thought our people could not compete with the foreign growers.

I think the subject shou'd not be allowed to drop but should be further looked into, for, during the fiscal year, ended June 30th, 1899, silk and silken goods to the value of $3,752,539, were imported into Canada, and upon them duty amounting to $1,091,218.49 was paid.

It may be interesting to learn that our Quebec people indulged in silk handkerchiefs during the year to the value of $24,489 and in silk hosiery to the value of $1,174. In this respect they exceeded the Ontario people who only expended $939 ; but they fell short of the people of British Columbia who laid out $1,875 in silken foot-wear.

In sewing and embroidery silk, Quebec expended $8,700, more than one-half the expenditure of the whole Dominion, which speaks well for the industry of its ladies in certain directions.

An important work well done has been issued by the society, viz :—a "General Index to the Thirty Annual Reports of the Entomological Society of Ontario, 1870-1899, prepared by Rev. C. J. S. Bethune, D. C. L., Editor of the *Canadian Entomologist* ". The cost of this useful compilation to members is 25 cents per copy unbound and 50 cents bound in cloth.

Our branch has suffered from the loss by death and removal of some of its members. It is hoped that new additions will keep up our numbers.

REPORT OF COUNCIL.

The branch now includes 42 members (33 adults and 9 juniors).

The Treasurer's Report is submitted and will no doubt be found satisfactory.

The continued rainy weather of last summer prevented the members from having many field-days but two very enjoyable ones were held on the 16th June and 14th July.

Our thanks are due to the authorities of Morrin College for having continued to allow us the use of their rooms for our meetings.

CRAWFORD LINDSAY,
Secretary-Treasurer.

The following were elected officers :—President— Rev. Dr. Fyles, Vice-President—Miss E. MacDonald, Council—Hon. R. Turner, Mrs. R. Turner, Mr. J. H. Simmons, Miss Bickell, Miss Winfield, Mr. James Geggie.

LT. COL. CRAWFORD LINDSAY,
Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The fifth annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Education Department Building, on Friday evening, May the 10th, 1901.

Present; Messrs. Cox, Webb, Williams, Smith, Rossiter and Stewart. The President, Mr. D. G. Cox, in the chair. The minutes of the previous meeting were read and approved. The Secretary read the following Report of the Council.

The Council of the Toronto Branch of the Entomological Society of Ontario take pleasure in presenting the fifth Annual Report of the proceedings of the Branch for the year ending 30th March, 1901.

They are pleased to report that since the last annual meeting six new members have been admitted. As an offset to this four members have withdrawn.

During the year eight regular meetings have been held in the Education Department. At three of these papers have been read, viz:—

"On the Inflation of Larvae"	Arthur Gibson.
"The Colours of Insects"	G. M. Stewart.
"Aquatic Insects"	E .M. Walker.

It is hoped that more papers will be presented by the members during the coming year. Much discussion has been held on entomological matters, and a number of specimens have been exhibited.

A large part of the time of the meeting has been devoted to the collection of insects, which the Branch is preparing for the Ontario Education Department, and some headway has been made. The Orthoptera, the Coleoptera, and the Diurnals among the Lepidoptera have been classified. Many donations of specimens have been received for the collection, notably some Haitian Lepidoptera from Mr. Cox, and it is hoped that the members will collect for it as largely as possible during the coming season.

Many valuable papers have been received from various sources, notably the Cent. Exp. Farm, Ottawa, the Ohio Agricultural Experiment Station, the New York Agricultural Experiment Station, the United States Division of Entomology, the Cornell University Insectary, and the Chicago Entomological Society.

The Society also subscribes for the "Journal of the New York Entomological Society," and for the "Entomological News."

The Treasurer's report shows a small balance carried forward on the right side.

Respectfully submitted on behalf of the Council,

D. G. Cox,
President.

Mr. Cox then addressed the meeting, speaking of the work of the Society, and the means by which this work might be improved in the future.

The election of officers for the ensuing year resulted as follows:—

President	Mr. D. G. Cox.
Vice-President	Mr. E. M. Walker.
Secretary-Treasurer	Mr. J. B. Williams.
Librarian and Curator	Mr. Geo. Rossitor,
Members of Council	Mr. J. H. Webb. Mr. Arthur Gibson.

Mr. Cox asked for the opinion of members as to the admission of foreign specimens into the collection of insects. All the members were of the opinion that foreign specimens should be included, as they were included in the other branches of the museum.

It was decided to hold a Field Day in High Park on the 24th of May. The meeting then adjourned.

G. M. STEWART, Secretary.

REPORT OF THE LIBRARIAN AND CURATOR.

For the Year Ending 31st of August, 1901.

Thirteen bound volumes were received from Governments, Societies and Scientific Institutions during the year.

Two were obtained by purchase, one of which is the Century Atlas of the World.

One was presented to the Society by the Rev. Dr. Bethune, making sixteen bound volumes altogether.

Fifteen volumes were bound and placed on the shelves, making a total of thirty-one volumes added to the Library during the year.

The full number of volumes now on the register is 1,722.

Thirty-three volumes were issued to local members during the year.

There have been few additions made to the native collection during the past season, and nothing of special importance has been reported as having been taken in this locality.

An important addition was made to the exotics by the receipt of a collection of Japanese beetles; many of them being large and attractive specimens. A small collection of West African insects was presented to the Society by Mr. T. H. Hill, who has recently returned from that region, where he was engaged in missionary work for about seven years.

Respectfully submitted,

J. Alston Moffat.

AUDITORS' REPORT FOR THE YEAR ENDING AUGUST 31st, 1901.

Receipts.		Expenditure.	
Balance on hand, September 1st, 1900	$492 71	Paid for pins, cork, etc.	$60 09
Sales of pins, cork, etc.	72 12	Expense account (postage, etc.)	139 14
Advertising	31 85	Printing account	717 55
Sales of Entomologist	151 97	Annual meeting and report	163 28
Government grant	1,000 00	Library account	42 09
Members' fees	395 04	Salary account	375 00
Interest	11 51	Rent	175 00
		Balance, August 31st, 1901	483 05
	$2,155 20		$2,155 20

We, the Auditors of the Ontario Entomological Society, have examined the books of the Treasurer, compared them with vouchers and find them correct, and certify that the above is a true statement.

James H. Bowman, }
W. H. Hamilton, } Auditors.

REPORT OF THE MICROSCOPICAL SECTION.

The Microscopical Section of the Entomological Society of Ontario beg leave to present their annual report as follows:—A meeting for the purpose of re-organizing was held on February 22nd, 1901, when the following officers were elected:

Chairman	Dr. Bethune.
Secretary	E. A. Brown.
Committee	John Dearness. J. A. Bowman. R. W. Rennie.

On account of the lateness of re-organizing, only four meetings were held, with an average attendance of eight, as well as visitors.

During the season four papers were read –

(1) Microscopical Examination of Crystals	J. H. Bowman.
(2) Microscopical Examination of Bacteria	R. W. Rennie.
(3) Dermestes	J. Dearness.
(4) Pond Life	J. H. Bowman.

Besides these short notes on interesting subjects were read, and many very interesting slides of microscopic plants, crystals and insects were examined.

The Section gave an entertainment by request in the school-room of the Bishop Cronyn Memorial Church; an address on "Mosquitoes and Malaria" was given by Dr. Bethune, followed by an exhibition of microscopical objects by Messrs. Bowman and Brown; the attendance was large and all were greatly interested.

CHARLES J. S. BETHUNE, EDGAR A. BROWN,
Chairman. Secretary.

REPORT OF THE BOTANICAL SECTION.

The re-organization meeting of the Botanical Section of the Entomological Society of Ontario was held on May 4th, 1901, when the following officers were elected :—

Chairman	R. W. Rennie.
Vice-Chairman	Dr. C J. S. Bethune.
Secretary	E. A. Brown.

Eight meetings were held during the summer, commencing May 11th, and every alternate Saturday evening thereafter, with an average attendance of seven, besides visitors. A very pleasant and profitable field-day was spent at Komoka on July 13th. At each meeting interesting subjects were discussed, and objects of interest reported. Six papers were read, viz. :—

(1) The Study of Botany with the Camera	R. W. Rennie.
(2) A Trip to Sable Island	W. E. Saunders.
(3) Pond-net (Hydrodicton Utriculatum)	J. H. Bowman.
(4) Collecting Native Orchids	Dr. C. J. S. Bethune.
(5) Hydra	J. H. Bowman.
(6) Fungi	John Dearness.

R. W. RENNIE, EDGAR A. BROWN,
Chairman. Secretary.

REPORT OF THE ORNITHOLOGICAL SECTION.

The year has been marked by a vigorous prosecution of Ornithological work, though not by any growth in the membership. Two regular meetings were missed on account of uncontrollable circumstances, and one extra meeting was held in July. At the nine meetings held a total of thirty-two members were present, averaging less than four to each meeting.

Three of these meetings were spent informally in the examination of the collections of Messrs. Keays, Gould and Saunders, and at the remaining six meetings ten papers were read as well as a number of shorter notes on interesting subjects. The papers read were as follows :

"The Acadian Owl in Captivity," F. Norman Beattie, Guelph.

"Concerning Woodpeckers," Robert Elliott, Bryanston.

"The Birds of Algoma," Rev. C. T. Scott, London.

"The Extinction of the Elk," and "The Woodcock's Love Song," L. H. Smith, Strathroy.

"The Buff-breasted Sandpiper," Dr. G. A. McCallum, Dunnville.

"Humming Birds," "The Grasshopper Sparrow," and "Notes on Sable Island," illustrated by skins and the very rare nest and eggs of the Ipswich Sparrow, as well as other birds, photographs and curios from the Island,, W. E. Saunders, London.

"The Habits of the Saw-whet Owl," Wm. H. Moore.

Five of these papers have appeared in the *Ottawa Naturalist*, one in *Forest and Stream* and the remaining four will probably come out in the *Naturalist.*

Three new birds have been recorded for the county in which the members of the section reside, namely: The Glaucous Gull, the Golden Eagle and the King Eider Duck. Short notes on each were written, and two of these have already been published in the *Ottawa Naturalist*, and the two former specimens were exhibited at the Section's meetings.

The migration lists for the year have been compiled, shewing a large number of species noted in their migrations by members.

A list of the birds of Middlesex County is in course of preparation and may be completed during the coming year.

The Opossum, a mammal not recorded in recent years in Ontario, has been noted in two places, one specimen having been taken near Port Colborne, and two at Rond Eau. The occurrences have been duly noted at the meetings.

Mr. Robert Elliott has identified a skull of a local skunk as *Chincha putida*, the Eastern skunk. The official skunk for northern Ontario from Nipissing to Rainy River is the Canada skunk, *Chincha mephitis*, which we have yet to find.

Interesting discussions have, of course, taken place on many subjects recorded on the minutes but not referred to in this report.

During the past year addresses and demonstrations have been given on Ornithological subjects to teachers and other assemblies by members of the Section as follows: By Mr. W. E. Saunders to the Teachers' Association meeting at Easter; the Boys' Club of St. James's Presbyterian Church; the Epworth League of the Wellington Street Methodist Church; a farmers' meeting at Derwent, Ont.; a lecture, illustrated with lantern slides, on the Birds of Canada, at the High School, Montreal, under the auspices of McGill College; the same lecture was repeated in London at the First Methodist Church, the First Baptist Church and to the Epworth League of the Dundas Centre Methodist Church. By Mr. H. Gould to the teachers of the Lorne Avenue Public School and to the Kindergarten, Lorne Avenue, London.

J. E. Keays, Chairman.
W. E. Saunders, Secretary.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present its annual report.

Meetings were held weekly throughout the year, excepting the usual summer vacation. Geological studies were actively prosecuted and field work was done in several localities in the south western peninsula. Amongst other places visited were Grand River Valley, near Galt; 2, Sydenham Valley at Alvinston; 3, Corniferous and Hamilton formations in Bosanquet. The specimens obtained were placed upon the table and after study went to increase the various collections of the members os the Society.

The Chairman of the Section made interesting reports upon his trips to the locations above named. For the first time the Corniferous strata has been made a special study, being fully exposed by operations having in view the drainage of lands adjacent to Mud Creek, which empties into the Sauble, near Port Frank. Fine specimens of Orthoceras from two to three feet in length were found, many being broken by explosives used in blasting away the rock. A very perfect specimen, one foot long, was shown to the class. Spirifers of larger size (Spirifer striatus) were found very abundantly in beds of clay above this formation, also a number of other fossils, Murchisonia being the chief.

Because of the great excess of silica the use of the rock is very much restricted, being too hard and too fragile and also containing iron, which makes it un-suitable for building purposes. This is in decided contrast to the formation exposed at St. Mary's, where the Corniferous is remarkably free from silica and contains an abundance of fossils of the Devonian Period and occasionally the remains of fossil fishes are found.

The Hamilton formation immediately overlies the Corniferous at Arkona, where it is exposed by the Sauble River. This vicinity is well known as one of the finest collecting grounds in the world. Many distinguished scientists have visited the Sauble Valley, amongst others Prof. Hall, New York ; Prof. Winchell, Ann Arbor, and many others Geologists of lesser note. Here trilobites abound, the characteristic species being Phacops Bufo. Fossil corals, also of great beauty and variety, completely silicified, are found here and Crinoids in vast abundance.

In visiting this section a geologist may leave his hammer at home and come provided only with baskets or an express wagon which he would have no difficulty in filling with these ancient fossil remains. Specimens from this district have been shipped to many museums in Great Britain and United States. The Academy of Natural Science in Philadelphia was this year presented with a small collection of local specimens by the Chairman of the Section who thus advertises Ontario in an efficient way. When our city sees fit to establish a museum we have at our doors a rich field in which to secure a very varied collection suitable for studying the Paleontology of this district and which also may be used for exchanges.

After being Chairman of the Geological Section since its inception, excepting one year when Professor Andras occupied it, Dr. Wolverton has now resigned in favor of Mr. Kirk, a capable and energetic member of our section.

The following reports will be placed in the hands of the Editor :

Roads and Road-making	Mr. Kirk.
The Galt Dolomites	Mr. Goodburne.
Methods of Concentrating Gold	Mr. J. G. Smith.
The Mastodon of Mount Brydges	Mr. J. G. Smith.

[The report on "Roads and Road-making" has already been published elsewhere.]

THE GALT DOLOMITES.

Limestone is perhaps one of the most abundant of all minerals, and the most widely distributed, quartz alone excepted. It appears in very many different forms, the ordinary one of limestone being best known, with marble as the most valuable, and these two show the extremes of the substance—one the original material and the other the metamorphic condition. Limestone is composed of carbonic acid, 44 ; lime, 56 ; but carbonate of iron or magnesia may take the place of a portion of the carbonate of lime. A very large amount of our limestones, however, are properly dolomites, which differ from the limestone in the process of deposition, and in chemical structure. Dolomite consists of carbonate of lime, 54.35 ; carbonate of magnesia, 45 65 ; these including a small portion of protoxide of iron (FeO) or magnesia. Dolomites are calcareous, and appear to have been simple chemical precipitates, and in some cases to have originated from the alteration of limestone rocks by magnesia salts.

Water containing free carbonic acid (derived from decaying vegetable matter) dissolves a portion of carbonate of lime, but the bicarbonate thus formed is easily decomposed, even by mere exposure to the atmosphere and a precipitation of calcareous matter takes place. In this manner the calcareous tufas of our swamps, (notably at Komoka), together with stalactites and stalagmites are produced, and similar processes on a large scale have deposited the strata in ancient seas and lakes. All limestones effervesce in acids ; but the dolomites effervesce only feebly, unless the acid be heated. In some parts of Canada dolomites abound, but I think they are best shown along the Grand River from Elora to Galt, at Guelph on the Speed, and at some places in Dumfries. It is of several shades, commencing at the top with a yellow color, and becoming lighter and semi-crystalline about 50 feet lower ; while about 100 feet from the top of the series the rock is almost white, and granular in texture—a most beautiful stone. Some thin beds are of a pale brown, still retaining the granular appearance. Between the semi-crystalline and granular textures there is, in some places, a thin band of rock which will powder in the fingers, and seems to be principally sulphate of magnesia. This, however, only appears in places. The dolomites yield excellent building stones, especially in the semi-crystalline series, while the granular layers are chiefly burned for building lime. In fact, the lime produced from these rocks is renowned for its excellence, becoming extremely hard with age, and it is doubtful if as fine a quality can be produced from any other class of limestone. The dolomites of the Guelph series are placed in the Onondaga Salt group of the Upper Silurian, which derives its name from Onondaga, near Syracuse, N. Y. In Canada the Onondaga deposits attain between 200 and 300 feet in thickness, and consist of thin-bedded dolomites, with greenish shales (chiefly argillaceous dolomites), and some masses of gypsum. The latter does not occur in regular beds, but in lenticular masses. The dolomites above the gypsum are generally arched and more or less fissured, while those on which the gypsum rests retain their horizontal position.

This Guelph formation is peculiar to Ontario, its rocks not having been traced beyond the limits of the province. It follows the western limits of the Niagara, and occurs as a bean-shaped mass, gradually thinning out westward toward Lake Huron, and eastward near Ancaster. Its greatest thickness is about 160 feet. Its principal exposures are at the places I have already mentioned. Along the Grand River it frequently presents vertical cliffs 80 feet high.

The fossils contained are small in variety, and most of them are identical with those belonging to the Niagara beds, as Favosites gothlandica and Halysites catenulatus, but others appear to be confined to this formation. As a general rule the fossils are somewhat obscure, and for the most part not very abundant. The most characteristic fossil, and one peculiar to this formation is the Megalomus Canadensis, usually found in the form of internal casts, and I will confine my attention to this fossil.

The Megalomus belongs to the Lamellibranchiata, or conchifera order, which are marine or fresh-water animals of the acephalus (headless) type. In the adult condition they have laminated gills or branchiæ for breathing purposes, and they secrete a bivalve external shell. The two valves are nearly always of equal size, but always more or less inequilateral. (A line drawn straight through the middle of an equilateral shell, divides it into two equal parts.) These mollusks are exceedingly abundant in the fossil state, though not so numerous as the brachiopods in older rocks. The existing species, both marine and fresh-water, number about 3,000, but about double that number of fossil forms have been found, which belong to many successive periods, and it is very probable this is only a very small portion of the Lamellibranchiate fauna of the past.

In their classification these mollusks fall into two leading sections and four groups ;—

1. Asiphonida.
    (a) Pleuroconcha.
    (b) Orthoconcha.

2. Siphonida.
   (a) Integro-Pallialia.
   (b) Sinu-Pallialia.

The animals of the first section are without the respiratory tubes possessed by the Siphonida, and it is with this first section that we have to do.

The first group, Pleuroconcha, rest in their natural position with one valve *below* and the other *above*. They have but one large muscular impression in the centre of each valve, which forms a shallow pit, occupied by the muscle which keeps the valves closed. An example is the oyster and Ambonychia radiata of the Hudson River Group, Lower Silurian.

The second group, or Orthoconcha, are without siphonal tubes, but their valves are *right* and *left*, instead of upper and under, as regards its normal position, and the muscular impressions are two in each valve. The most remarkable of this genus is the Megalomus Canadensis, of Hall, which occurs in great numbers in the Guelph formation, principally in the form of internal casts, very few specimens showing the original shell.

The Meg. compressus of Nicholson, is allied to the M. Canadensis. It is smaller and more compressed ; the umbones are more prominent, and the pallial line more distinct. Other fossils include many varieties of the Murchisonia, and these examples on the table are M. Loganii.

All these specimens are, however, internal casts only, very few having been found presenting the outer shells, and in the case of Megalomus, scarcely anything is known of its outward appearance. The filtration of water and the presence of carbonic acid in the dolomite have destroyed the organic matter of the shell, and left the cast of the interior. There is a great quantity of water in these rocks, saturating the stone heavily in the lower portions, which, when freshly quarried, is quite soft, becoming very hard on losing a portion of the water on contact with the atmosphere. Some of the quarries contain few fossils, others are full of them, and while one quarry may produce good specimens, the majority from others are of scarcely any use for cabinet purposes. Some fossils are also found in the gravels, but are very badly worn.

J. L. GOODBURNE.

METHODS OF CONCENTRATING GOLD.

There are two methods of concentrating gold—by means purely mechanical and by chemicals. For the efficient separation by the former process innumerable appliances have been invented whose fundamental principle is in nearly every case based on the great specific gravity of gold.

For separating low grade gold ores an interesting appliance has recently come into general use in Western America. It consists of an endless rough-flanged belt passing over two pulleys, one slightly lower than the other, thus giving the upper surface of the belt. Near the lower wheel the pulverized ore is deposited and is carried upward by the revolving belt which meets a stream of cold water. This carries off the quartz, leaving the gold adhering to the rough belt whence it is later deposited in settlers.

Cyaniding and Chlorination have of late received much attention from mining men. The former particularly is made use of in a great majority of up-to-date mills.

The ore is crushed to a pulp before cyaniding and thrown into cyanide vats, after which a solution of cyanide of potassium is added to dissolve the finer particles of gold. The solution is drained off into "zinc" tanks filled with zinc clippings, where the zinc displaces the gold and the metal is deposited with the zinc slimes whence it is easily recovered by retorting.

In chlorination it is not necessary to crush the ore so fine. It is also roasted before being passed to chlorination vats to break up all sulphides. After the barrel is charged with the required amount of chloride of lime and sulphuric acid it is revolved slowly from three to eight hours, when the gold solution is drawn off through a filter into lead-lined settling tanks. From this the gold may be obtained by SO_2 H_2S or by the charcoal method.

The cyaniding process, while it will not save more gold than will chlorination, possesses the advantage of saving from 70 to 80 per cent. of the silver values in an ore as well and hence is in more general use.

J. G. SMITH.

THE MASTODON OF MOUNT BRYDGES.

During the summer there was found on the estate of Mr. Duncan Forbes of Mount Brydges the jaw of a Mastodon. The find occurred several feet below the surface in a peat bog.

The jaw weighs 54 lbs., and is 30 inches long by 24 inches wide, by 18 inches high. It differs from the jaws of living animals in its great massiveness—a section through it almost forming a circle. The exterior is black in color and of a hard dense structure, being apparently filled with infiltrated iron.

The jaw contains four teeth—two on either side—none in front. The row on either side is about three inches wide by ten inches long. The front teeth contain three rows of nipples and the rear four rows.

A loose tooth was found to weigh one pound and a half. The teeth exhibit a remarkable degree of preservation, as the enamel remains as it was when the animal died. The tops of the nipples are notched by wear, show the hard black dentine beneath. From their appearance the animal would seem to be herbivorous.

The front of the lower jaw shows a peculiar structure as though it had contained tusks or teeth during the animal's lifetime.

(The finders attempted to reach other parts but have been so far unsuccessful.)

J. G. SMITH.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

THROUGH THE REV. C. J. S. BETHUNE, D.C.L., DELEGATE.

When a society has attained to mature age, like an individual it cannot be expected that its thirty-seventh year should be marked by any great crisis or any striking event. It is natural, therefore, that the representative of the Entomological Society of Ontario should be able to present to the Royal Society of Canada only a report of quiet work and steady progress since our meeting a year ago.

The thirty-seventh annual meeting was held in November last at London, the headquarters of the Society. The opening proceedings were rendered notable by the joint meeting which was held with the recently organized London Horticultural Society. It was held in the splendid new building of the Normal School and was attended by a large and appreciative audience, representing both the Societies and the general public as well. It was presided over by Prof. C. C. James, Deputy Minister of Agriculture for Ontario, who delivered an address on the value of Horticulture in its various aspects, its intellectual advantages and its attraction for persons of literary tastes. He was followed by Mr. W. E. Saunders, of London, who read a paper on "The planting, care and pruning of the trees in the parks and streets of the city," which is a matter of much importance in a place whose beauty and attractiveness largely depend upon the noble avenues of trees in the streets, and the parks secured to the public by a wise and rare forethought. Dr. Fletcher, Dominion Entomologist and Botanist, then gave an address, illustrated with beautiful lantern pictures, and showing how trees should be grown and treated and the admirable results that have been obtained at the Experimental Farms at Ottawa and in the North-west. He also took up the subject of insects and described a large number of the most destructive species and the remedies that may be most successfully employed against them.

The afternoon of the following day was chiefly taken up with a discussion on the San José scale in Ontario. Mr. G. E. Fisher, Provincial Inspector, who was present by direction of the Minister of Agriculture, gave a full account of the prevalence of this most pernicious insect in several localities, and of the experiments which had been undertaken in order to procure, if possible, a practical remedy. Whale oil soap and crude petroleum were the principal applications employed, and while the former was not entirely effective, the latter was regarded by many as too dangerous a remedy for general use. Dr. Fletcher, Prof. Webster and others took part in the discussion. The attack is believed by all to be a most serious one, and to require prompt and effective measures for its repression.

The 31st annual report of the Society to the Legislature of Ontario was presented at the opening of the last Session and published in February. It consists of 112 pages, illustrated with forty-six engravings in the text and a photogravue portrait of Mr. J. Alston Moffat, for many years past the devoted Curator and Librarian of the Society. The volume contains reports from the various officers and sections, and from the flourishing Branches at Montreal, Quebec and Toronto. There is appended also an account of the second annual meeting of the North-west (Canada) Entomological Society, which has its headquarters in Alberta.

During the winter and spring fortnightly meetings for the study of Entomology were held on Friday evenings, and alternately with them the Microscopical Section held its sessions; much serious work was done in both departments and great interest was shown by the members. The Geological Section met weekly on Tuesdays under the guidance of Dr. Woolverton, and the Ornithological Section once a month at the residence of Mr. W. E. Saunders, one of the most devoted and well-informed bird lovers in the Province of Ontario. The Botanical Section has been in abeyance for a time, but is now being revived with every prospect of success. From this brief account it will be seen how wide a range of country the Society's operations cover and how many departments of natural science are included in its work.

In the report to the Legislature there are published the papers read at the annual meeting, among which may be mentioned the Presidential address of the Rev. Dr. Fyles, who took for his subject the offices served by insects in the promotion of the fertilization and improvement of plants. He gave an interesting and instructive account of a large number of plants and their attendant insects, and illustrated his remarks with a series of beautiful diagrams of the structure of numerous flowers, the work of his own hand.

Professor Lochhead, of the Ontario Agricultural College, read papers on "The systematic and economic study of forest insects in Ontario," setting forth the necessity of endeavouring to diminish the ravages of insects in addition to the work of protection against fire already undertaken by the Provincial Government; "The silk worm industry in Ontario," which has been begun on a small scale in the County of Essex but which the Professor contends cannot be made a lucrative occupation in this country; "The present status of the San José scale in Ontario;" "Nature-study lessons on the squash bug," intended for the use of school teachers; and an account of the "Insects of the season of 1900," which had proved especially injurious in the south-western peninsula of Ontario.

Mr. J. Alston Moffat contributed papers on "Anosia Archippus yet again," in which he discussed the various theories set forth regarding the migrations of this remarkable butterfly; "Parasites in the eggs of Chrysopa;" and "Notes on the season of 1900," enumerating some interesting occurrences, among which may be mentioned the capture in London of specimens of the curious Myriapod, *Cermatia forceps*, a southern creature which has been gradually working its way to the north.

Professor F. M. Webster, of Ohio, one of our honorary members who takes an active interest in the Society and attends its annual meetings, read papers of much practical value on "Results of experiments in protecting apples from the Codling moth," referring especially to the injury wrought by the second brood ; "Results of some applications of crude Petroleum to orchard trees," setting forth the danger of its use and the necessity for a much larger series of experiments before it can be recommended as an insecticide to the ordinary fruit grower ; "Two Longicorn Beetles affecting growing nursery stock," viz: *Saperda vestita* and *Oberea bimaculata*, which, though very familiar insects, have not been suspected of making attacks of this kind ; and "Observations on several species of Dermestidæ," a family of beetles well-known for their habits of feeding on museum specimens and many household articles, but not hitherto recognized as phytophagous also.

Dr. James Fletcher, Dominion Entomologist and Botanist, gave a very full account of the Injurious insects in Ontario during 1900," and described the attacks on cereals, fodder crops, roots and vegetables, and fruits, many of which were of a very serious character. Mr. Arthur Gibson, assistant Entomologist at the Central Experimental Farm, described the methods which he had found most successful for "The breeding of Lepidoptera and inflation of larvæ," illustrating the latter subject with some very beautiful specimens that he had prepared.

Reports on "Insects of the Year" were furnished by four of the Directors, Messrs. J. D. Evans, Trenton ; D. G. Cox, Toronto ; James Johnston, Bartonville ; and R. W. Rennie, London. The performance of this duty by these officers of the Society is of much importance as it brings together information regarding the chief insect attacks of the year in the various sections of the Province.

The Rev. Dr. Fyles contributed a descriptive paper on "The Dragon-flies of the Province of Quebec," and short papers were read by Mr. J. Dearness on "A parasite of the San José scale ;" Mr. C. W. Nash, "Notes on Danais archippus at Toronto ;" and Mr. P. B. Gregson on "Curious habits of the larvæ of *Dermestes talpinus*." The last named gentleman also furnished an account of the proceedings at the annual meeting of the North-West (Canada) Entomological Society.

The volume also contains a synopsis of the most important papers read at the meeting of the Association of Economic Entomologists, which are of great interest and much practical value.

The funds of the Society are shown by the Treasurer's statement to be in a satisfactory condition. The Librarian reports valuable additions of books and specimens, the number of the former on the shelves being almost 1700. The membership of the branches at Montreal, Quebec, and Toronto has steadily increased, and that of the whole Society grows from year to year. All interested in its welfare have much reason to be pleased with its continued success, and the valuable scientific and practical work which is being performed by its members.

The Annual Report, whose contents have just been described, records the practical observations and work of the Society ; for the scientific and systematic department reference must be made to the monthly magazine, "The Canadian Entomologist," the thirty-third annual volume of which is now being published. The volume for 1900 consists of 387 pages, and is illustrated with seven full-page plates and thirty-three figures from original drawings. The contributors number sixty four, and represent Canada, the United States, Mexico, Brazil, Great Britain, Germany, Switzerland and South Africa. As there are upwards of a hundred articles, besides short notices and book reviews, it would occupy too much space to mention the subject of each. They may, however, be grouped as follows :

Papers on Classification : North American Yponomeutidæ and Tineidæ, by Dr. H. G. Dyar ; the Wasps of the Super-family Vespoidea, and changes in generic names of Hymenoptera, by W. H. Ashmead ; the Genus Orchelimum, by Jerome McNeill ; the Genus Catocala, by Prof. G. H. French ; Notes on Idiocerus (Jassidæ), by C. F. Baker ; the North American species of Choreutis and its allies, by Prof. C. H. Fernald ; New Mexico Bees of the Genus Cœlioxys, by Prof. T. D. A. Cockerell ; Colorado Bees, by E. S. G. Titus ; some species of Acronycta in the British Museum, by Prof. J. B. Smith ; the Types of Noctuid Genera and a series of papers on the Classification of Butterflies, by Prof. A. R. Grote ; some Genera of Mites, by N. Banks, and the Bibliography of Coccidæ, by G. B. King.

New genera, species and varieties have been described in the Lepidoptera by the late Rev. G. D. Hulst, Dr. Wm. Barnes, Rev. Dr. Fyles, G. M. Dodge, Miss Murtfeldt, W. Beutenmuller, Prof. J. B. Smith, Prof. C. H. Fernald and G. A. Ehrman ; in the Hymenoptera, by Prof. T. D. A. Cockerell, C. Robertson, W. H. Ashmead, Dr. L. O. Howard and A. D. MacGillivray ; in the Diptera by D. W. Coquillett, C. W. Johnson, A. L. Melander, J. S. Hine and Prof. G. H. French ; in the Orthoptera by Dr. S. H. Scudder ; in the Hemiptera (Homoptera) by J. L. Handcock, C. F. Baker, E. D. Ball, Prof. H. Osborn, Adolph Hempel, Prof. T. D. A. Cockerell, Prof. J. D. Tinsley, E. M. Ehrhorn, G. B. King and E. E. Bogue ; in the Hemiptera (Heteroptera) by A. N. Caudell, and in the Arachnida by N. Banks. Twenty-seven new genera are described and 213 new species and varieties.

Interesting and valuable life-histories of various insects are given by Dr. J. Fletcher, A. Gibson, Dr. H. G. Dyar, H. Bird, J. O. Martin, E. D. Sanderson and Dr. L. O. Howard. Papers on collecting and other observations of insects are given by W. Knaus, E. F. Heath, J. A. Moffat, Rev. Dr. Fyles, H. H. Lyman, J. G. Needham and A. J. Snyder.

In economic Entomology there are important papers by C. P. Lounsbury on Insect Bites and their effects ; T. Pergande on a Plant-louse injurious to Violets ; Prof. F. M. Webster on the Purslane Saw-fly, Harpalus caliginosus as a Strawberry Pest and the Diptera found in wheat fields ; Prof. W. G. Johnson on the Destructive Pea Aphis, and Prof G. H French on a Fly causing Epilepsy.

In addition to the foregoing publications, a General Index to the thirty Annual Reports of the Society (1870 to 1899) has been prepared by the editor, Rev. Dr. Bethune, and published by the Ontario Department of Agriculture. It is very full and complete and will prove of much value to all who have occasion to refer to these volumes.

INJURIOUS INSECTS OF THE SEASON OF 1901.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

Affecting Farm Crops.

In the south-west portion of the Province the wheat crop suffered severely from the attacks of the Hessian fly. In several counties the yield per acre was very much reduced, notwithstanding the plowing under of a large area both in the fall and spring.

So urgent was the demand for more information regarding the life-history and habits of the pest, that a bulletin was published by the Department of Agriculture in August, and distributed freely throughout the infested areas. This bulletin emphasized the great need for co-operation among the farmers themselves, if they ever hoped to cope with the fly. Late sowing, good preparation of the land to be sown to wheat, and trap-strips, will be found effective if all the fields are treated alike ; but if some fields are sown early and become infested with the fly in the fall, there is no way of preventing the flies which emerge from these fields in May from migrating to uninfested fields and damaging them before harvest.

Orchard Insects.

As in previous years, the codling worm (Fig. 17). was the most destructive orchard insect, especially in the sections where the insect is double-brooded. A word of warning may be given here, lest owners of orchards become lax in the matter of spraying with Paris green immediately after blossoming, while attempting to entrap the second brood by bandages. We can never afford to give up spraying with Bordeaux and Paris green, for by doing so the codling worm and fungus diseases are kept in check. The frequent rains about the blossoming period interfered with the spraying operations, and when the applications were not renewed, the effect of the Paris green was very slight indeed.

In connection with the bandages, I find that sacking is the best material for bandages. It is the cheapest as well as the most easily applied and removed. Success with bandages requires careful attention to them every two weeks. They should be removed from the trees and examined for cocoons, then replaced. It is next to impossible to examine the burlaps thoroughly without removing them from the tree.

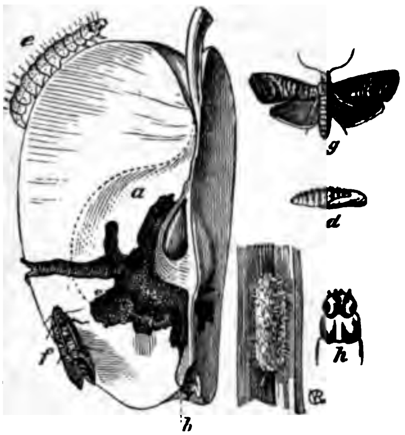

Fig. 17. Codling moth. Quarter of an apple shewing the injury caused by the worm (*a*); the moth (*f* and *g*); chrysalis (*d*); larva (*e*), its head and first segment (*h*); cocoon (*i*). Riley.

The Haseltine trap lanterns were kept burning nearly every night from June 7th to September 7th, to ascertain the kinds of insects that are attracted to such lights. The results are somewhat startling on account of the capture of a large percentage of decidedly beneficial insects. For example, 30 per cent. of all the forms taken were Ichneumon flies; nearly 2 per cent. were Lady beetles and Ground beetles; 2⅓ per cent. were Dung beetles; 3 per cent. were Mosquitoes and Crane-flies; 1 per cent. Fireflies. Sixty per cent. of the whole number taken were composed of injurious forms, such as May beetles, Squash bugs, Cabbage worms, Cucumber beetles and moths. The strangest thing in connection with the trap lantern experiments was the complete absence of Codling moths. It is evident that as a means of capturing Codling moths, these trap-lanterns are a decided failure.

THE POTATO STALK-BORER.—(*Trichobaris 3-notata.*)

Under date of Sept. 14th, Mr. J. A. Auld, M.P.P. for South Essex, wrote me regarding a serious insect attack of the potato vines on Pelee Island, and sent samples of the dying stalks. These branches were widely tunnelled from the base to near the tip. The potato crop will be a partial failure this year and the loss will be serious. In 1900, Pelee Island shipped 30,000 bushels of potatoes, but in 1901, there will be few bushels to spare.

The cause of the trouble is a small snout-weevil (Fig. 18, *c*) which deposits its egg in the stalk some time in late May or early June. A small white grub (Fig. 18, *a*) hatches from the egg, and begins at once to tunnel the centre out of the stalk. It is then nearly half an inch in length, with whitish body and brown head, and legless. It constructs within the tunnel a rude cocoon out of fibres or clay within which it changes to a pupa, (Fig. 18, *b*.) The pupal stage probably does not last longer than two weeks, for in the same stalk I found grubs, pupæ and adults. The adult beetle remains in the vines all winter according to Dr. J. B. Smith.

The only outward appearance of the presence of a pest is the premature blackening of the stalks, and consequent wilting; but when the stalks were handled, and pressure applied, they collapsed more readily than would normal plants.

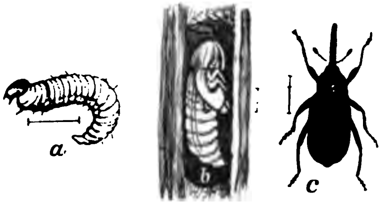

FIG. 18.—Potato Stalk-borer; *a*, grub; *b*, pupa; *c*, beetle.

Although this Borer is well-known in many parts of the Western States, in Iowa, and Nebraska, for example, this is the first record of its presence in Ontario as a destructive potato insect. Fortunately remedial treatment is both simple and practical, from the fact that the adult remains in the vines over winter. If the vines are gathered and burned as soon as possible after the potato harvest, the majority of the *adults* will be destroyed.

ASPARAGUS BEETLES.

Attention was called in my Notes of the last two seasons to the progress of the two species of Asparagus beetles westward from the Niagara river. In 1899 they had reached St. Catharines; in 1900 nearly to Hamilton. This year they were present in the Asparagus beds at the O. A. C. farm in considerable numbers. I have not heard of their appearance in places west of Guelph, but undoubtedly they are *Westward, Ho!* and are bound to join hands with their brothers in Michigan.

At the College the Twelve-spotted species (*Crioceris 12-punctatus*, fig. 19) was by far the more abundant, and it is apparently leading the other species (*C. asparagi*, fig. 20) in its march through Ontario.

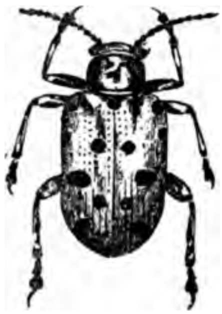

Fig. 19. Crioceris 12-punctatus.

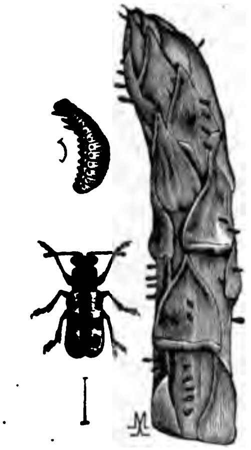

Fig. 20. Crioceris asparagi: beetle, grub, and eggs on plant.

About St. Catharines the beetles did much damage. They appeared in such numbers on the tender shoots and disfigured them so much that the shoots were unmarketable. They seemed to gnaw the epidermis as the shoot was peeping above the ground, before it was ready to cut for market.

It is probable that when greater attention is given to the destruction of the beetles after the spring cutting is over, fewer beetles will hibernate and give trouble in early spring.

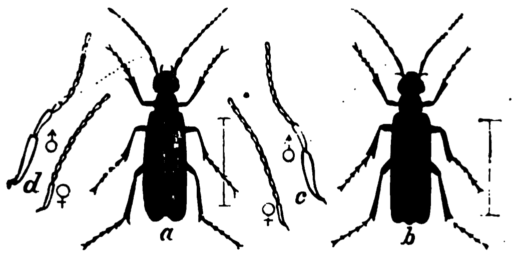

Fig. 21. Blister Beetles—*a*, Epicauta cinerea; *b*, E. Pennsylvanica.

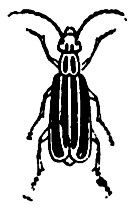

Fig. 22. Epicauta vittata.

BLISTER BEETLES.

These insects were numerous the past season, and in some sections "alarm was beginning to be felt." Three species were common, viz., *Epicauta Pennsylvanica*, *Epicauta cinerea*, and *E. vittata*. Of these *Epicauta vittata* was perhaps most commonly seen. All are rather soft-bodied insects, and may be distinguished by their color. *E. Pennsylvanica* (fig. 21 *b*) is uniformly black; *E. cinerea* (fig. 21 *a*) is blackish with grey streaks along the margins of wing covers and middle of thorax; and *E. vittata* (fig. 22) yellowish with black stripes. The striped species was present in large numbers on beet crops; the ash-colored species on vetch, horse beans, lucerne, and the black blister beetle on Golden Rod.

When the life-history of blister beetles is studied it is found that their larvæ prey upon grasshoppers, and hence are beneficial. A question, therefore, arises: "Should we destroy the beetles and try to lessen their numbers?" It must be understood that the more adults we kill the fewer larvæ will develop to destroy the egg-pods of grasshoppers, and the greater the number of grasshoppers appearing the following season. When these factors are borne in mind there is good reason for allowing the adult beetles to feed unmolested. They never remain long enough to do much serious injury. They usually appear in large numbers for a week or ten days, but they disappear as suddenly. It is a matter of observation that blister beetles are more numerous than usual the season following one when grasshoppers were very abundant.

Before the advent of the Colorado Potato Beetle these blister beetles were the "potato beetles." In many districts in the northern part of the province they are still the "potato beetles."

PLANT LICE.

Plant lice, or Aphids, (Fig. 23), were more abundant than usual this past season. The early spring with its moist, cloudy weather was strongly in favor of their rapid development; and among the more common forms that did considerable mischief were the Cherry Aphis (*Myzus cerasi*), Apple Aphis (*Aphis mali*), Plum Aphis (*Aphis prunicola*), Currant Aphis (*Myzus ribis*), the Rose Aphis, and the Grain Aphis. As Aphids are sucking insects, that take their nourishment in the form of plant juices through a slender tube, arsenical poisons on the plants have no effect. Frequently the presence of a few plant lice in the early part of the season is altogether neglected, when a little trouble at that time would practically exterminate them. Many persons are unwilling to believe that from a few Aphids tens of thousands of them will develop before July. Huxley once computed that "the uninterrupted breeding of ten generations of plant-lice from a single mother would produce a mass of organic matter equivalent to that of 500 million of human beings." As Dr. Howard remarks, this great productiveness is due more to the early age at which the Aphids begin to reproduce, rather than to any extreme prolificacy.

The majority of the generations or broods produced during the summer are wingless, but at intervals winged broods occur. This is very probably a provision for the distribution of the species. The last brood of the season is a winged one, composed of both males and females. Soon after mating the males die, while the females perish aftor the deposition of the eggs.

Plant-lice have possibly more enemies, which feed upon them, than most other injurious insects. These enemies are Lady-birds, Braconids, Aphis lions, maggots of Syrphus-flies, and certain other dipterous maggots. All of these kill immense numbers of Aphids, and in some instances exterminate them, but in most cases extreme rapidity of development more than counterbalances great mortality.

THE CURRANT APHIS (*Myzus ribis*).

Although never a serious pest, this Aphis disfigures and renders unsightly the leaves of currants. Attention is here called to it on account of the many inquiries regarding the purplish swellings or blister-like elevations on affected leaves, which make their appearance in May. In the concavities on the under surface will be found clustered large numbers of Aphids, both winged and unwinged, all busy sucking the juices from the leaf.

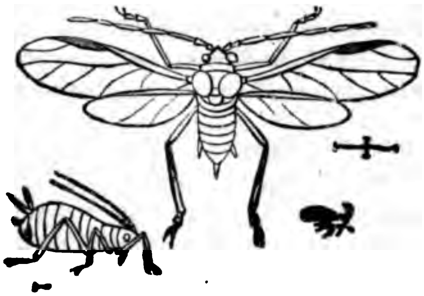
Fig. 23. Plant-lice (Aphis) winged and wingless (much enlarged).

It is seldom that these Aphids are troublesome after midsummer.

Prompt picking of affected leaves, or applications of Kerosene Emulsion, whale oil soap solution, or Gillett's Lye, are the best methods of dealing with Currant Aphis.

Cherry Aphis (*Myzus cerasi*).

During June the cherry trees in many sections became badly infested with plant-lice (*Myzus cerasi*). The leaves of the large terminal twigs were chiefly affected. They became much distorted, and discolored by a fungus feeding on the honey-dew, and with excrement; and then became inrolled with the Aphids feeding within. The effects on the leaves are detrimental to the growth of the tree, inasmuch as much nourishment intended for the development of the tree is taken by the plant-lice within their own bodies.

These Aphids are shining black insects. They frequently multiply so very rapidly that the smaller leaf stalks and twigs become completely covered with them. The leaves and branches near by become very sticky from the abundance of honey-dew excreted.

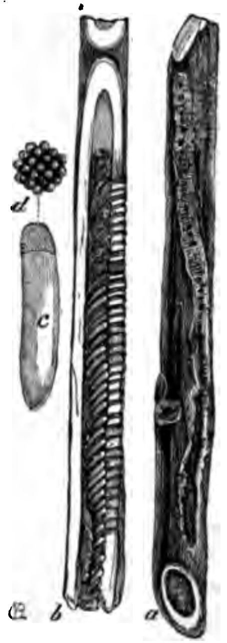

Fig. 26. Snowy Tree-Cricket, a twig showing punctures, b same split open, showing eggs in position, c egg magnified, d granulated top of egg. (Riley)

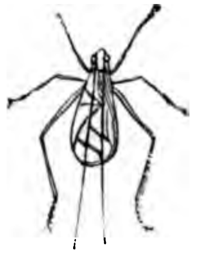
Fig. 24 Snowy Tree-Cricket, male.

Enemies of the Cherry Aphis are usually present, and kill an astonishing number, sometimes almost ridding the trees.

The life-history of the Cherry Aphis is similar to that of other Aphids which appear on many cultivated plants. They winter over in the egg-stage; in early spring the eggs hatch; and a brood of females appear, which produces living young at a rapid rate on the Cherry up till July, when they disappear. Although not definitely proved, it is probable that the lice migrate to the roots of the Cherry, and to other plants. In autumn, a brood of winged males and females make their appearance. After mating, the females deposit eggs for the winter about the buds of the Cherry.

Treatment, to be effective, must begin early, before the Aphids roll the leaves around themselves; otherwise they are difficult to kill. Kerosene emulsion, tobacco solution and whale-oil soap solution are all good.

(10 lbs. of tobacco waste are thoroughly soaked in water; and the solution is made up to 40 or 50 gallons. Dr. Fletcher recommends the addition of 1 lb. of whale-oil soap to the barrel of tobacco solution).

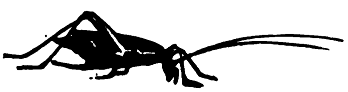
Fig. 25. Snowy Tree-Cricket, Female.

SOME BUSH-FRUIT INSECTS.

By bush-fruits I mean red raspberries, black raspberries, currants, and gooseberries.

Perhaps more inquiries were made regarding injuries done to bush-fruits than to any other horticultural crop. Fortunately under careful management and treatment most of the insects can be kept under control.

The Snowy-Tree Cricket (Œcanthus niveus), Figs. 24 and 25. Although the work of this insect is readily recognized, yet too many of our gardeners are unacquainted with it. The female in autumn deposits her elongated cylindrical eggs in punctures in rows (Fig. 26), which are nearly vertical on the erect canes. The result is a long, ragged wound, which interferes materially with the growth of the cane. The remedy is to cut out and burn the wounded portions before the eggs hatch in the spring.

The Raspberry Cane Maggot.—In June frequent complaints were made regarding a wilting of the tips of raspberry canes. The pith of the canes was burrowed from the tip downwards for a short distance, then the inner bark was girdled, producing a wilting of the tip. The portion of the stem burrowed is of smaller diameter than normal, and is of a dark blue color. The affected canes usually die, for the maggot continues to tunnel its way downward to the base.

The cause of the mischief is a two-winged fly belonging to the genus *Phorbia*. From observations made in 1891 by Dr. Fletcher, and in 1896 by Prof. Slingerland, it would appear that the girdling commences early in May, and the maggot reaches the base in June. In the case of the specimens sent from Hespeler on June 11th, the maggot had not then reached more than half way to the base.

The eggs are deposited in early spring at the base of the tip leaves. The insect winters over in the pupa stage at the base of the plant.

The remedy in this case also is to remove the wilting tips as soon as noticed, and burn them.

The Pale Brown Byturus.—During June the flowers and flowerbuds of raspberries suffered severely from the gnawing attacks of small, hairy, yellowish-brown beetles. The injured buds scarcely ever develop fruit for the reason that the stamens and pistils are destroyed.

Later in the season when the eggs have hatched, the grubs damage the nearly full-grown berries. When full-grown, the grub becomes a pupa in the earth, where it remains all winter.

The remedy for the Byturus is to spray with paris green and lime solution.

The Raspberry Cane Borer.—On July 1st, Mr. W. N. Hutt, B. S. A., of Southend, sent me specimens of red-raspberry canes which were punctured by this cane-borer. The tips of the young shoots were wilted, and drooping. The rows of punctures around the cane, and the hole between the rows in which the egg is laid were quite evident, as well as characteristic. The grub on hatching from the egg bores downward in the pith, and reaches the root by autumn. There it transforms into a pupa and rests all winter.

THE ROSE-CHAFER.

(*Macrodactylus subspinosus*).

Usually this beetle confines its attacks to roses and grape, and often does much injury to the blossoms. Last June, however, it began eating the half grown peaches in two large orchards near Niagara-on-the-Lake, and considerable alarm was created lest it should spread to neighbouring orchards. The alarm was occasioned by the presence of immense numbers of the Chafers, and by the knowledge that arsenical poisons were of little use in such an emergency. As many as eight or ten chafers were found feeding on a single peach, and but few peaches were left untouched.

It is probable that the most available remedy at the time is to jar the Chafers from the trees in early morning into receptacles, or on sheets where they may be killed. The operation should be repeated on several successive mornings until the danger is over.

The sudden appearance of the Chafers in immense numbers is accounted for by the habits of the larvæ, which feed on the roots of grasses in sandy locations. In the same locations the pupæ are formed, but when the adults emerge, usually all about the same time, they betake themselves to the most convenient orchard or vine-yard. A line of investigation lies open in this connection. If the feeding grounds of the larvæ were discovered and ploughed in spring, while the insects are in the pupal condition, many of them would be destroyed.

The life history is as follows: The female Chafer deposits her eggs in the ground in late June or early July. These hatch in a few weeks, and the grubs feed on the roots of grasses till October, when full-grown they descend still further beyond the reach of frost. In May, they become pupæ, and in June the adults emerge.

THE OAK-PRUNER (*Elaphidion villosum*).

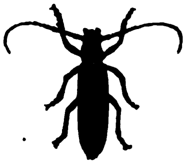

Fig. 27, The Oak-pruner.

Fig. 28, The Oak-pruner larva.

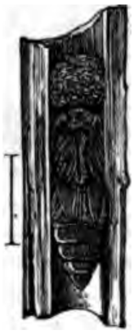

Fig. 29, The Oak-pruner pupa.

The work of this beetle (Fig. 27) is so interesting that it deserves some mention here. Under date of July 30th, the Hon. Justice Osler, of Osgoode Hall, wrote me an accurate and interesting account of the work of this Borer in breaking off branches of Oak, as observed on some islands in the Georgian Bay, near Parry Sound. At a later date the same gentleman favored me with specimens of the work of the insect from which I was able to get the larvæ (Fig. 28). Mr. Osler writes: On a tree affected by it will be seen the ends of branches hanging down, and leaves brown and dead. Examination shows that they have been deeply sawn through, remaining attached by a bit of the bark. Opening the end of the drooping branch in July or August, a very lively Borer is found in the shape of a fat, whitish grub, who has closed up the passage at his rear by his saw-dust. He does not appear to work backward, towards the trunk of the tree. Near where his life work appears to have begun, which is at the junction of some leaf or smaller branch, are often seen one or two small, hard, semi-cylindrical cases, about the size and shape of the common 'Lady-bird,' empty, but probably the harbor in which the egg was laid which produced him."

The habits of this beetle are described in greater detail by Dr. Saunders in "Insects Injurious to Fruit," pp. 31, 32; and by Dr. Packard in the "Fifth Report of the Entomological Commission," pp. 63-69. It is not only injurious to the oak but also to the beech, chestnut, birch, hickory, peach and apple. Dr. Saunders calls it "The Apple Tree Pruner."

Attention may be directed here to the wonderful instinct which the insect undoubtedly possesses. The female deposits an egg in an angle of a leaf stalk, near the tip of the twig. The grub, on hatching, feeds on the soft, pulpy pith, until it reaches the branch, when it gnaws the harder, woody tissues, and begins tunneling the branch to its base. Then the sawing process occurs. "This," Dr. Fitch says, "is a most nice and critical operation, requiring much skill and calculation, for the limb must not break and fall while he is in the act of gnawing it apart, or he will be crushed by being at the point where it bends and tears asunder, or will fall from the cavity where it breaks open and separates. To avoid such casualties, therefore, he must, after severing it, have time to withdraw himself back into his hole in the limb, and plug the opening behind him before the limb breaks and falls." With the eye of a trained woodman, he "cuts the limb asunder so far that he supposes it will break with the next wind which arises and withdraws himself into his burrow, and that he may not be stunned and drop therefrom, should the limb strike the earth with violence when it falls, he closes the opening behind him by inserting therein a wad formed of elastic fibres of wood." Usually his sawing is so accurate that he has not long to wait before he falls with the limb. After the branch has fallen the grub continues to eat and grow. It changes to a pupa (Fig. 29) sometimes in the fall, but usually in the spring. The adults appear in June, the female to lay her eggs as already described.

MARCH FLIES (*Bibio*).

Under date of May 29th, a correspondent at Weston sent me three specimens of Bibio. He says:—"Yesterday our beds were infested by an immense quantity of flies,—eating Pansy buds, and also the flowers." At other dates also, reports have been received regarding the supposed damage to plants by these flies; but although I have invariably at the time asked for specimens actually seen injured by the flies, I have never received any. It is hardly likely that these flies injure the buds and blossoms, although the maggots are known to attack the roots of grasses. The usual food of the larvae, however, is decaying vegetable matter.

In the discussion which followed upon the reading of this paper Prof. Webster referred to the Hazeltine Moth-trap, which he denounced as a perfectly useless affair and recomended that the Canadian government should impose a duty of $5.00 on everyone imported into this country in order to prevent its introduction, 40,000 had been sold in the United States this year and the owners expected to sell 50,000 next year. He had yet to learn that it had caught any codling moths, or at any rate more than a very few, though it professed to exterminate them in the orchard where it was placed.

The Potato Stalk-borer he had found destructive to tomatoes and egg-plant as well as potatoes, near Lake Erie. The 12-spotted asparagus beetle had not yet been found in Ohio, but was evidently spreading rapidly. For the Rose Chafer he could not advise poison, as no poison had been found to kill it, it would eat those in ordinary use and apparently thrive on them. It can however, be destroyed on fruit-trees by using a can with some coal-oil in it attached to the end of a pole and knocking off the beetles into it with a light rod; this can best be done early in the morning when they are not so active as in the heat of the day. It breeds in sandy soil which is not very dry, and forms its pupa there; the least disturbance of the soil by cultivation will kill it out.

Mr. Moffat presented an acccount of the death of a woman at St. Thomas which was supposed to have been caused by the bite of an insect. He had obtained the specimen from the doctor in attendance and exhibited it to the meeting. It proved to be the well-known ground beetle, *Galerita Janus*, Fabr., which is usually found under stones in moist places and is classed among beneficial insects. As this beetle was found in the patient's bed four days after she was taken ill, it seems incredible that it should have had any connection with the blood-poisoning, which began in the patient's face so many days before, and terminated fatally.

NOTES ON THE SEASON OF 1901.

BY J. ALSTON MOFFAT, LONDON.

After an unusually severe January, February and March a favorable opening of spring was anticipated, but in that we were disappointed in this locality. April was cold until near the close, when we had a few warm days, which had a marked effect on insect life, and brought forth *Hymenoptera* and *Diptera* in profusion, whilst the hibernated butterflies enjoyed the bright sunshine immensely, and the small blues came out in numbers. May was decidedly disappointing. For although it brought forward vegetation rapidly, it was quite too cool to promote the development of the larger forms of Lepidoptera, so that the lilac blooms passed without the appearance of sphinges and other moths that usually attend their attractive feast. June 1901 was reported to be the coldest June experienced in a great many years. But on the 24th it took a turn, and a hot term followed, which lasted for five weeks without a break, with such extreme heat as will have impressed itself on the memory of those who passed through it for the rest of their lives. Such peculiar weather conditions had the effect of disarranging the usual appearing of common forms of insects. Some came out sooner than usual, others were late in showing themselves, and others failed to put in an appearance at all, whilst a few kinds were extremely abundant.

Never before have I seen *Aphides* so prevalent, they were out in all their kinds and colors, on root and branch, and in such masses. But to make amends the lady bird larvæ were noticeably numerous, and no doubt this was the cause of their greatly reduced numbers at the end of the season. The potato beetle was late in appearing, but was in more than usual abundance later on. The imported cabbage butterfly remained scarce until the late summer broods appeared. *Papilio turnus* (Fig. 30), the yellow swallow-tailed butterfly, appeared early and stayed late. It was seen about the middle of May, and was not wholly absent in the middle of August. A long continued period on the wing, which I have often seen but cannot account for, and which seems to require some explanation. Neither the Thistle butterfly, the Hunter or the Red Admiral were much in evidence during the season here. The *Argynnids* in their various species were moderately plentiful. About the middle of August I received an intimation from Mr. J. D. Evans, of Trenton, that he had taken a specimen of *Papilio Cresphontes* there in fair condition, the furthest east it has yet been reported in Canada. About the same time Dr. Bethune observed one in London ; and on the 25th I picked a damaged specimen off a flower with my fingers, the first of the kind I have seen abroad in several years. It was also reported to me as having been taken in other places in this neighborhood. So that southern butterfly has not yet succeeded in establishing itself as a permanent resident in this locality ; it is even now but a periodical visitor.

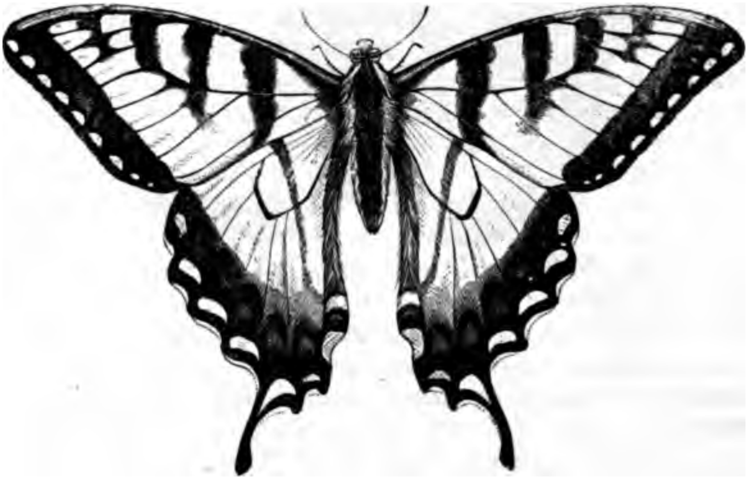

Fig. 30 —The Yellow Swallow-tailed Butterfly (*Papilio turnus*)

Anosia Archippus (Fig. 31) was late in arriving, and remained scarce through the season. The first one I saw was on the 12th of June, in a very worn and faded condition. Then I saw another on the 15th, so bright and fresh that it might have passed for a newly emerged specimen. I received from Mr. Henry Bird, Rye, N.Y., a letter dated 15th May, 1901, in which he remarked that he had seen an *Archippus* butterfly before that. As scarcely any of the observations published upon the movements of *Archippus* have come from New York State, I take the liberty of giving publicity to the remarks on the subject which he so kindly favored me with, never suspecting that they would go into print. But as they are so interesting in themselves besides assisting in illuminating a page of *Archippus* history, I take pleasure in producing them for the benefit and enjoyment of others.

"My observations, Entomologically, are very meagre so far. One *Archippus* butterfly was noted: This one was sailing along rapidly, a couple of feet from the ground, with an eye open for the first appearance of the milk weed no doubt, and was skimming northward eight or nine miles an hour. It was a worn specimen, and though its progress through the air was much faster, its angling flight searching for milkweed would bring initial progress at about this figure. As I was following in my buggy and had the example in sight some ten minutes I could judge pretty well of its progress.

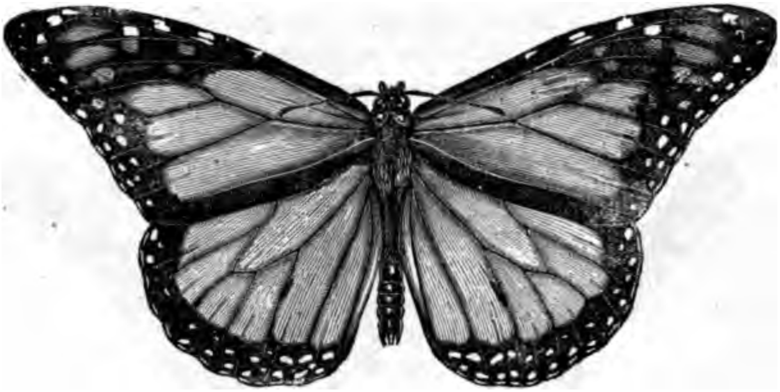

Fig. 31.—The Archippus Butterfly.

"But in crossing water much better time is made, of course, and I have made some observations here. I have explained how my home is situated on the shore of Long Island Sound, a long, narrow body of salt water, eight miles wide at this part, and 120 miles long. Long Island, a great sandbank of glacial days, lies the other side of this Sound, and divides it from the Atlantic ocean. Although the warm Gulf Stream swerves off from our coast much further south, still there is some effect on the Long Island fauna, and it affords many features belonging to a more southern latitude. So naturally we may look for southern migrants from that quarter, and this is amply borne out in actual observations. In my younger days, when the "struggle for existence," etc., was not so pressing, I used to find time for a day's fishing now and then, and in a row-boat would anchor a half mile out from the shore on some submerged reef, in about thirty feet of water, and catch the rock-bass in which the Sound abounds. Passing a day in this manner, one has time between bites—both of the bass and of luncheon—to notice what is going on overhead. And one is sure to be struck with the number of butterflies constantly coming from the Island to the main shore. We might expect the supply to be largest on the main land, and that emigration would be going the other way, yet it is invariably as first stated. By far the largest number seen will be *Archippus*, next *Papilios* and *Colias Philodice*. *Archippus* fly at the highest elevation, but begin to drop on nearing shore, so on passing the fishing grounds are sometimes within reach. I have watched them so many times, and their numbers and flight are surprisingly regular. The species seems on the wing continually *during* the last half of the season, and their flight over the Sound waters seems most methodical But in this case—they are going north, mind—they fly singly. To a watching fisherman, as an example gets abreast of his boat, he may look out across the water and see another coming in about the same track, and if he strains his eyes a bit, still another, just a speck, can generally be made out, well up in the blue. And so it goes on through the warmer hours of the day. *Archippus* or *Turnus* do not mind the flight at all, but poor little *Philodice* or *P. rapæ* are glad indeed to settle on the first bit of herbage or flower they can reach. So the number which cross this body of water is large, and one rarely sees an example in the water.

"The most striking emigration in point of numbers that I recall as coming from Long Island was that little white and black speckled geometer—*Caterva Catenaria*, which came over in myriads during one whole day, and gave our landscape quite a snow-squally effect. But these feeble flyers were dependent on a stiff breeze for making the trip at all, and then about half of them fell in the water. So much for emigration."

In reference to the point which Mr. Bird has called my attention to: that those separate specimens of *Archippus* were all flying north when crossing Long Island Sound, I would remark, that in doing so at that time they are as certainly obeying their natural inclination to travel, and that for a purpose, as when they go south in crowds later in the season. For, if those single individuals could have been traced to their destination it would have been found that they were making for a general gathering place, where they were forming one of those immense swarms which have attracted so much attention, preparatory to their leaving in a flock to go south together. So the fact of their going north at that time does not conflict with their going south later on, as they have to gather from all directions, at what appears like a preconcerted place of meeting. Constrained by an internal monition, or drawn by some invisible magnetic influence, they gather from every point of the compass to one particular place, as unerringly as the needle turns to the pole, and there await the gathering of the crowd, to start out at the proper time on their long southward journey. As they do not, so it seems that they cannot at that time go singly; and the belated stragglers that are left behind the migrating flocks in this latitude, assuredly perish.

Numbers of *Archippus* butterflies were to be seen flitting about the streets of London, during the first week of September, and occasionally stopping to feed at moist places. The last one observed on the wing was on the 27th of the month.

Fig 32.

About the first of September Mr. Balkwill brought in some beetles that had been found feeding upon green corn inside the husks, with a sample of the injured corn. The beetle proved to be *Euphoria inda*, Linn. (Fig 32), a well-known injurious flower beetle, also bearing an unsavory reputation for spoiling soft ripe fruits, such as pears, plums and peaches. It was the first time my attention had been drawn to its attacking corn in this country, although it is known as an old offender in that direction in the south-western States. From the appearance of the corn that was presented, it is evident that this beetle is quite capable of doing a vast amount of damage in a cornfield where they are numerous; which, fortunately for Canada, they have not, so far, been found to be. Their ability and method of reaching the corn inside the husks has been a subject of considerable discussion in the localities where their injury has been greatest, some claiming that it is only after the husk has been torn open by bird or beast that the beetles can reach the grain. But from the wonderful strength with which they are endowed, which every one who has handled them must have noticed, one could readily believe that they would have no difficulty whatever in pushing their way inside the husk by the silk end. And, seeing that they bury themselves in the ground to pass the winter, they might easily dig through the husks in order to obtain the succulent morsels within, in the absence of other things within their reach whereon to satisfy their cravings.

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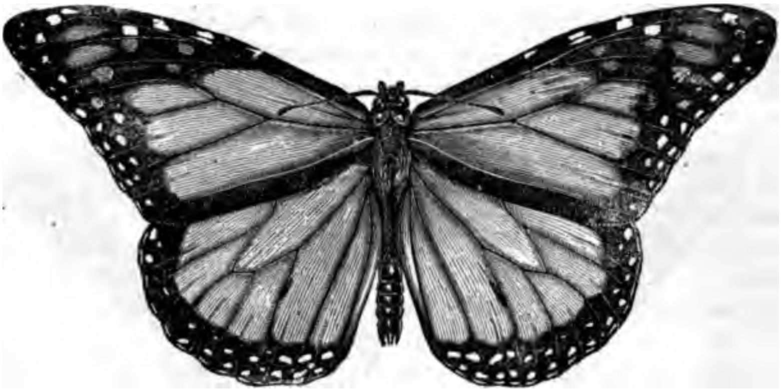

Fig. 31.—The Archippus Butterfly.

"But in crossing water much better time is made, of course, and I have made some observations here. I have explained how my home is situated on the shore of Long Island Sound, a long, narrow body of salt water, eight miles wide at this part, and 120 miles long. Long Island, a great sandbank of glacial days, lies the other side of this Sound, and divides it from the Atlantic ocean. Although the warm Gulf Stream swerves off from our coast much further south, still there is some effect on the Long Island fauna, and it affords many features belonging to a more southern latitude. So naturally we may look for southern migrants from that quarter, and this is amply borne out in actual observations. In my younger days, when the "struggle for existence," etc., was not so pressing, I used to find time for a day's fishing now and then, and in a row-boat would anchor a half mile out from the shore on some submerged reef, in about thirty feet of water, and catch the rock-bass in which the Sound abounds. Passing a day in this manner, one has time between bites—both of the bass and of luncheon—to notice what is going on overhead. And one is sure to be struck with the number of butterflies constantly coming from the Island to the main shore. We might expect the supply to be largest on the main land, and that emigration would be going the other way, yet it is invariably as first stated. By far the largest number seen will be *Archippus*, next *Papilios* and *Colias Philodice*. *Archippus* fly at the highest elevation, but begin to drop on nearing shore, so on passing the fishing grounds are sometimes within reach. I have watched them so many times, and their numbers and flight are surprisingly regular. The species seems on the wing continually during the last half of the season, and their flight over the Sound waters seems most methodical But in this case—they are going north, mind—they fly singly. To a watching fisherman, as an example gets abreast of his boat, he may look out across the water and see another coming in about the same track, and if he strains his eyes a bit, still another, just a speck, can generally be made out, well up in the blue. And so it goes on through the warmer hours of the day. *Archippus* or *Turnus* do not mind the flight at all, but poor little *Philodice* or *P. rapæ* are glad indeed to settle on the first bit of herbage or flower they can reach. So the number which cross this body of water is large, and one rarely sees an example in the water.

"The most striking emigration in point of numbers that I recall as coming from Long Island was that little white and black speckled geometer—*Caterva Catenaria*, which came over in myriads during one whole day, and gave our landscape quite a snow-squally effect. But these feeble flyers were dependent on a stiff breeze for making the trip at all, and then about half of them fell in the water. So much for emigration."

In reference to the point which Mr. Bird has called my attention to: that those separate specimens of *Archippus* were all flying north when crossing Long Island Sound, I would remark, that in doing so at that time they are as certainly obeying their natural inclination to travel, and that for a purpose, as when they go south in crowds later in the season. For, if those single individuals could have been traced to their destination it would have been found that they were making for a general gathering place, where they were forming one of those immense swarms which have attracted so much attention, preparatory to their leaving in a flock to go south together. So the fact of their going north at that time does not conflict with their going south later on, as they have to gather from all directions, at what appears like a preconcerted place of meeting. Constrained by an internal monition, or drawn by some invisible magnetic influence, they gather from every point of the compass to one particular place, as unerringly as the needle turns to the pole, and there await the gathering of the crowd, to start out at the proper time on their long southward journey. As they do not, so it seems that they cannot at that time go singly; and the belated stragglers that are left behind the migrating flocks in this latitude, assuredly perish.

Numbers of *Archippus* butterflies were to be seen flitting about the streets of London, during the first week of September, and occasionally stopping to feed at moist places. The last one observed on the wing was on the 27th of the month.

Fig 32.

About the first of September Mr. Balkwill brought in some beetles that had been found feeding upon green corn inside the husks, with a sample of the injured corn. The beetle proved to be *Euphoria inda*, Linn. (Fig 32), a well-known injurious flower beetle, also bearing an unsavory reputation for spoiling soft ripe fruits, such as pears, plums and peaches. It was the first time my attention had been drawn to its attacking corn in this country, although it is known as an old offender in that direction in the south-western States. From the appearance of the corn that was presented, it is evident that this beetle is quite capable of doing a vast amount of damage in a cornfield where they are numerous; which, fortunately for Canada, they have not, so far, been found to be. Their ability and method of reaching the corn inside the husks has been a subject of considerable discussion in the localities where their injury has been greatest, some claiming that it is only after the husk has been torn open by bird or beast that the beetles can reach the grain. But from the wonderful strength with which they are endowed, which every one who has handled them must have noticed, one could readily believe that they would have no difficulty whatever in pushing their way inside the husk by the silk end. And, seeing that they bury themselves in the ground to pass the winter, they might easily dig through the husks in order to obtain the succulent morsels within, in the absence of other things within their reach whereon to satisfy their cravings.

THE PAINTED LADY BUTTERFLY,

(*Pyrameis Cardui*, L).

BY JAMES FLETCHER, OTTAWA.

The irregularity in the appearance of the Painted Lady Butterfly has frequently been noticed by entomologists. For several years the species will be scarce or almost unseen in a locality, then suddenly large numbers will appear, winging their bold and fearless flight in every direction, and will produce what, among collectors, has been called a "Painted Lady year." This insect is one of the very few which are identical with their European representatives, and this one has a very wide distribution, being found, with very slight variations, almost all over the Northern hemisphere. The sudden appearance of a swarm early in the season is due to the migratory habit of this strong-winged fly. There are two broods in the season, as with most of the Vanessians. When I was a boy in England, an annual excursion eagerly looked forward to was a visit made to some caves at Upnor, on the River Medway, a few miles from Rochester. Late in November or December, armed with an unnecessarily large supply of tallow candles and matches, a select party of youthful aurelians used to hie to these caves for the unusual pleasure of catching butterflies in winter. Having reached the caves, we had to enter by crawling over a mound which almost filled the mouth of the cave, when a comparatively large chamber was found with three or four passages running off in different directions. Here the candles were lighted. In small pockets along the passages, hibernating specimens could always be found of the Peacock Butterfly, *Vanessa Io*, and the small Tortoise-shell (*Vanessa urticæ*) of about the same size, and with very similar habits to our Canadian (*V. Milbertii*), to which indeed, unless the two are put side by side and compared, it bears a somewhat close superficial resemblance. Occasionally in these forays, we were lucky enough to find a few Painted Ladies. All the butterflies were hanging from the upper surface of the passages or crevices, with their wings closely shut, and with the antennæ drawn back between the wings. The Peacocks and small Tortoise-shells were easily seen, owing to their dark colour, but the beautiful mottled under-sides of the Painted Ladies made them rather hard to distinguish in the flickering candle light. This butterfly cave was supposed to be a very secret hunting ground, and all who visited it were in honour bound only to take such specimens as were perfect, and only just so many as they actually required.

The Vanessians hibernate in the same way in this country, not only in caves but in hollow trees and in buildings. *Grapta j-album* and *Vanessa Antiopa* I have frequently hibernated artificially in a rather dark unused attic, or in a wooden box behind a fence out of doors. This habit of hibernating in the perfect state is accountable for most of the occasional notices in newspapers of the appearance of butterflies in warm days during the winter.

Last spring the Painted Lady was not uncommon at Ottawa in early June, but was not noticed with *Vanessa Antiopa*, *Grapta j-album* and *Grapta Progne*, sipping maple and birch sap in May. The butterflies came suddenly in June; all through the month, until the new brood appeared about the middle of July, they were a conspicuous feature of the woodland, along roads, in gardens, and in clover-fields. The flight of the Painted Lady is quick and irregular; it seldom stays long in the same place, flying hap-hazard from flower to flower in a most unbusiness-like manner, always ready for a gambol with another of its kind, dashing close past or circling round and round a new comer. It flies, too, later in the evening than any butterfly I have observed, and at that time of the day seems to delight to settle on buildings. Two or three specimens will sometimes choose the same tower of observation, over and around which they will chase each other apparently with great delight, stopping occasionally in their wild flight, and soaring upwards opposite to each other like two boys, sparring for several seconds at a time. Not only will these intrepid insects dash at other butterflies, but they seem particularly fond of worrying the large locusts—*Dissosteira Carolina* and the clicking *Circotettix verruculatus*—when these are flying by or are hovering in the air over their mates. These clumsy flyers, surprised and indignant at the unexpected onslaught, make a few spasmodic efforts to evade their nimble persecutors, but soon settle down with rustling wings to the ground.

The Painted Lady seems particularly to enjoy flying round and round the tops of mountains. Collecting on the bare black summits of mountains, where there is little cover, is always a matter of some difficulty, but this is much increased by these frolicsome, restless, fickle, "ladies." After carefully stalking, perhaps creeping on all fours, over hot rough rocks, towards a much desired Argynnis, or Chionobas, which, although very much on the alert, has at last settled for a few moments, how often are the collector's hopes dashed to the ground by seeing one of these restless sentinels rush in and stir up his quarry, driving it off over the edge of the mountain, not to return again for a long time. This, however, is far from being the case with the unwelcome tormentor, which is back again within a few moments, sunning its wings within a few feet of him, but just beyond the reach of vengeance, and ready for the next effort. *Vanessa Californica*, a cousin of the Painted Lady, was not uncommon during the past summer in the Rocky Mountains and was also found to have the same, in the eyes of the collector, most objectionable habit.

In Dr. Scudder's splendid work, the "Butterflies of the Eastern United States and Canada," a most interesting account is given of the Painted Lady and its habits. Quoting from Meyer-Dur, he says, "Its wildly timorous behaviour is quite striking; it is uncommonly audacious; swift and savage it dashes irregularly about, scarcely observing the pursuer; heedless of the net it returns directly to the place it has left, and sits with horizontally opened wings on the dry earth or spots of sand. It is a nimble, lively, youthful, untamed, petulant insect which shows in its behaviour no resemblance to its proud but circumspect neighbour *Atalanta*."

Dr. Scudder says himself of this butterfly: "It frequently alights on stone walls heated by the sun, and is greatly attracted by flowers, particularly by thistles and the other plants upon which the caterpillar feeds; here it may readily be taken; not so in other spots, for although very fearless, and even impudent, it is exceedingly wary, dashing off headlong at the slightest alarm."

In 1884 a remarkable occurrence of the Painted Lady Butterfly was noted, and the fact was recorded by Dr. Saunders in his presidential address to the Society (Can. Ent., xvi., p. 211) that it was so numerous in Manitoba as to have been the cause of some alarm to farmers, who feared that the caterpillars might attack some of the growing crops. A similar invasion occurred last summer (1901) in North America and caused at first much anxiety to farmers in the West. The species was noted at Ottawa, and the insect was extremely abundant at Nepigon and from that point westward to the Pacific. Newly emerged specimens were taken at Nepigon on the 1st July. Manitoba seems to have been the centre of greatest abundance in Canada. Mr. A. J. Dennis, of Beulah, Manitoba, writes on the 10th June: "*Pyrameis Cardui* is as a rule an uncommon species here. I have never taken more than one or two specimens in a season, but this year they are in countless numbers. They simply cover the prairies and have been flying in all directions for the last six weeks." A few letters were received from farmers anxiously enquiring whether the caterpillars which were abundant on summer-fallows, were likely to attack crops after they had finished the weeds. They were informed that this was not in the least likely. Mr. Donald Macfarlane of Oak Lake, Manitoba, writing on the 25th June, says: "These caterpillars first appeared in this district during a spell of dry weather about two weeks ago. They were first seen on thistles and other weeds which they rapidly devoured, and are now spreading over many other plants; even the roadways are strewn with myriads of these insects, all seeming to be in sympathy with the Government's immigration policy and moving westward." In travelling through Manitoba early in July I saw large numbers of the caterpillars feeding upon the Canada Thistle, but particularly upon the Borraginaceous weed, Blue Bur

(*Echinospermum Lappula*). This was a new food plant for the species, and it is rather remarkable that it should have been so conspicuously the favourite food plant in the West. The Blue Bur is not indigenous on the prairies but has spread rapidly as an agricultural weed in Manitoba and the North-West Territories during the past year or two. Upon some fields which had been left for summer-fallowing large patches of this weed could be found stripped bare of every leaf by the caterpillars of the Painted Lady. Other plants noticed in different places, which were eaten by this caterpillar, were the Western Mugwort (*Artemisia Ludoviciana*) and the Pearly Everlasting (*Anaphalis Margaritacea*). In a few instances, caterpillars were seen upon the small Round-leaved Mallow, and were reported on holyhock and burdock. At Kaslo, B.C., I was surprised to find the larvæ feeding (30th July) on the prickly Borraginaceous plant, *Amsinckia intermedia*.

It is probable that our Canadian swarm may have come from the south and west. Mr. J. W. Cockle, of Kaslo, on Kootenay Lake, B. C., an energetic and very observant entomologist, wrote me last spring that on May 2nd a swarm of this butterfly had passed Kaslo. He says: "They were here on that date in thousands, but most of them only stayed a day or two; from which I suppose they have migrated to some other point." At the same time Mr. Cockle sent me the following interesting extract from the Spokane Review of May 26th:

MIGRATION OF BUTTERFLIES.

Spokane Review, May 26.

COUNTLESS THOUSANDS OF THEM FLYING OVER SOUTHERN CALIFORNIA.

"For weeks a remarkable migration has been taking place in southern California, and is still in progress. The migrant is a brown butterfly, known as Pyrameis cardui.

"At first the butterflies were noticed in twos and threes, then in dozens, then in countless thousands, all flying in one direction, to the northeast and parallel to the Sierra Madre range, Some idea of the numbers can be conceived when it is said that in looking across a lawn 90x40 feet four or five butterflies were continually crossing the line of vision, and this was true, so far as could be learned, of every lot in the vicinity.

"The insects move with a regular rate of speed, always in the same direction; now in pairs, again singly or in groups of 10 to 12. Such specimens examined show that they had travelled a long distance, and it is thought by some that the migration began in Mexico, hundreds of miles away.

"In attempting to guess at the cause, it may be assumed that it has been a favorable year for this butterfly in some region to the south, and that the countless caterpillars have changed into butterflies in such swarms that to obtain food they have begun this migration, the direction of which has been governed to some extent by the mountain range."

It may be the case that after this year *P. Cardui* will be less abundant than usual for some years, in accordance with the rule which seems to govern the occurrence of insects in general, namely, that an excessive abundance of a species generally foretells an unusual scarcity the next or the following year. Any remarkable observation concerning insects should always set the careful observer thinking, so that, if possible, the cause for the unusual occurrence may be discovered.

At the end of Dr. Scudder's article he gives the following under the head of *Desiderata*: "Cardui is one of the best subjects of study for those who wish to investigate the causes of irregular apparition; and only those who spend much time in the field can hope to solve the problem. A close observation of the comparative abundance of the butterfly for several consecutive years in the same locality, accompanied by the attempt to rear hundreds of the caterpillars, selecting only those which are very nearly full grown, and recording the proportion of healthy and infested ones, will probably show whether the attack of parasites is a *vera causa*.

The above is submitted to our members to remind them that there is still good work to be done even with this showy and not uncommon species. Should the insect appear again next year in any abundance, efforts should be made to carry out Dr. Scudder's suggestion with a view to solving the points raised. Exact dates of the first appearance of the butterflies and notes as to the times of greatest abundance should be carefully kept, and, if these facts are recorded by several observers at different points, they would certainly furnish much valuable information towards solving this problem.

THE NORTH AMERICAN FALL WEBWORMS.

By Henry H. Lyman, M.A., Montreal.

The name Fall Webworm, as is well known, was given by Harris to the caterpillar of the moth which he described under the name *Arctia Textor*, but for which he subsequently erected the genus *Hyphantria*, putting also in it the Many-Spotted Ermine Moth of the South, originally described under the name *Bombyx Cunea* by Drury. As I have already given in the "Canadian Entomologist" * a somewhat extended historical sketch of these moths, it is not necessary to repeat it here.

The earliest published opinion that *Cunea* Drury and *Textor* Harris were not specifically distinct, which I have been able to find, was that contained in the short paper by Mr. Graef in Bull. Brooklyn Ent. Soc., III. 14, 1880, he having taken all intergrades between immaculate and heavily spotted, and having seen the two forms in copulation, as had also Mr. Otto Meske of Albany. In the August number of the same journal, Mr. G. H. French recorded having bred both forms from a nest of caterpillars which had apparently just hatched from a single cluster of eggs deposited by a single moth. In the same year, Riley in the General Index to his Missouri Reports also placed *Textor* as a synonym of *Cunea*, but in Grote's Check List of 1882, *Textor* and *Punctata* stand, apparently, as good species, though without numbers, *Punctatissima* A. & S. being the only name given as a synonym of *Cunea* Drury.

In 1887 Riley issued Bulletin No. 10, U.S. Division of Entomology, on "Shade Trees and their Insect Defoliators," in which, writing of the Fall Webworm, he said, "The moths vary greatly, both in size and coloration. They have, in consequence of such variation, received many names, such as *cunea* Drury, *textor* Harr. *punctata* Fitch, *punctatissima* Smith. But there is no doubt, as proven from frequent breeding of specimens, that all these names apply to the very same insect, or at most to slight varieties, and that Drury's name *cunea*, having priority, must be used for the species."

Since that date, it seems to have been generally accepted that we had only one species varying greatly, and even *Congrua* Walker was supposed on Mr. Butler's authority to be merely a variety of *Cunea*. Having no evidence to urge against this conclusion, and having no acquaintance with the Many-Spotted Ermine Moth in life, and only a pair in my collection, I, as so many others continually do, accepted perfunctorily the dictum of these authorities, though living in the *Textor* region where *Cunea* does not occur, I could never really bring myself to believe that the two forms belonged to one species, and thus the controversy which started in the May 1899 number of the "Canadian Entomologist" over the question as to what species was the true *Cunea* of Drury quickened my interest in the Fall Webworm moths, and I determined to solve the problem if possible. I therefore appealed to Dr. Harrison G. Dyar to secure for me eggs of *Cunea*, and this he kindly did, instructing his assistant to get them for me.

On 3rd August I received from Washington a batch of eggs mailed on 31st July, accompanied by the moth which laid them, and which was still alive and still ovipositing.

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* Vol. XXXII. 122.

The eggs were deposited on the underside of a leaf, and were described as follows :

Diam. ½ mm., finely pitted, of a pale delicate green, the batch covered with white down from the abdomen of the ♀ but those laid after the moth reached me had very little of the down about them.

Riley described the eggs as being of a bright golden-yellow colour, having, on account of the pitted surface, the appearance under a magnifying lens of a beautiful golden thimble, but this is erroneous, as I have had and examined many clusters of these eggs, and all were of a pale, delicate green. Occasionally a few yellow eggs will be found in an egg cluster, but these appear to be bad ones, as I have never known them to hatch. The parent of this first brood, which I called No. 1, was a little rubbed, but so far as I could see was immaculate. It is shown on the plate as fig 1. (See frontispiece plate).

The larvæ hatched on 11th-13th August, giving an egg period of about 12 days in the latitude of Montreal.

These larvæ were carried by me to Rockland and Portland, Me , and back to Montreal, through the White Mountains, and were thus never out of the *Textor* region. They were fed on American Elm. For comparison, I also secured a part of a batch of *Textor* larvæ from a nest on a birch tree in Mount Royal Park, but having been entrusted to a friend while I was at the seaside they were, on account of their commonness, somewhat neglected, and only about half a dozen survived. When the larvæ of both forms were mature, I immediately saw that they differed strikingly from each other. The larvæ of *Cunea* vary considerably among themselves, but only within the limits of what may be called the *Cunea* form, never to my knowledge, and I have bred not far short of a thousand of them in various broods, varying in the direction of *Textor*.

The distinction between these larvæ may be broadly stated as follows :

Cunea has the lateral broad band, light in color, not much sprinkled, and the warts on it yellowish, the upper row occasionally tinged with orange, and the hairs chiefly blackish gray. *Textor* has the lateral band heavily sprinkled with black dots, giving it a bluish appearance, the warts upon it orange-red, and the hairs chiefly foxy red-brown.

These larvæ thus differ much more than the larvæ of many allied species whose distinctness is never called in question. Probably owing to the latitude in which they were raised this first brood matured slowly, and as the season advanced it was difficult to secure any green elm leaves, and to keep them fresh for any length of time. Some of this brood seemed to be affected by some intestinal trouble, the pellets of frass remaining held to the anus by a reddish filament. One was observed to have no less than four such pellets in a chain attached to the anus. When elm was no longer to be had I changed the food to apple. and was able to secure this in a green state even after the first frosts.

Those larvæ which spun up among the leaves were placed in a box with a zinc pan in the bottom, covered with a layer of crushed quartzite kept moist, the box being covered by a pane of glass, but those which spun up attached to the floor and sides of the breeding cage were not disturbed.

The specimens kept in the damp box began emerging on 18th March, 1900, and continued to do so up till the 12th April, when I left on an Easter trip to New York, Philadelphia, and Washington. Up to that date none had emerged in the breeding cage, and I feared that they must have become dried up, but on my return home on the 21st, I found that a number had emerged, and they continued emerging up to the 16th May, being thus just one month later than those kept in a moist atmosphere.

About seventy five specimens in all were reared, though some were crippled or otherwise damaged and not worth preserving, and of these only four females were absolutely immaculate, that is, about 5 per cent. of the whole brood, or about 10 per cent. of the females. Many of the latter sex were quite heavily marked, more so than the average male of ordinary broods, and the statement of Smith & Abbot, "the female being entirely white," is thus seen to be incorrect, though in the majority of cases it is true, and in the other broods raised by me, spotted females were of extreme rarity, not occurring at all in summer broods and very rarely in spring broods. Figures 2-11 are of this brood, showing the variation from heavily spotted to immaculate.

Had I been contented with the results attained in rearing this most remarkable brood I would have maintained that such a thing as an immaculate male *Cunea* did not exist, and should thus have been quite as far astray in my conclusions as the many authorities who have written of these forms.

But in order to see what difference, if any, existed between the spring and summer moths, I appealed again to Dr. Dyar to supply me with a batch of eggs along with the parent moth. This he was unable to do, as he did not secure any of the female moths, but he sent me two broods of young larvæ whose depredations upon sycamore trees had just begun to attract his attention.

These broods I named A and B, and as it was too much trouble, especially for the friend with whom I left them when I sailed for England in June, to go up the mountain to my sycamore tree for fodder, the food was changed, and brood A was reared on elm and brood B on apple.

On my sudden return from England on 8th July I took over the care of these broods and carried them on to imago, but to my surprise very few of brood A emerged, though the moths from brood B emerged very freely. The dates of emergence ranged in brood A from 27th July to 19th August, and in brood B from 27th July to 13th August. The moths from these broods were hardly at all spotted, a few only of the males being lightly marked, while many males and all the females were absolutely immaculate, and so indistinguishable in the imago state from *H. Textor*, but the larvæ had been of the *Cunea* form, though not quite so dark as the fall brood of larvæ reared in 1899. These moths are shown Nos. 13-16 summer brood A, Nos. 24-27 summer brood B.

From a mating between A and B I secured another batch of eggs, which in due time hatched and produced brood AB.

As Dr. Dyar had also been rearing a number of broods of *Cunea* at Washington I suggested dividing broods, each sending the other a half of one of the broods, in order that we might see what difference, if any, would result from difference of latitude.

I sent a share of brood AB to Washington and received in exchange a portion of one of the Washington broods resulting from a mating of moths of the summer brood. No distinguishing number was sent with this brood, and I merely marked it "½ Dyar's brood." Unfortunately Dr. Dyar's assistant omitted to make a note as to which brood he divided with me, and I am therefore unable to compare my results with those obtained at Washington.

The moths of this brood from Dr. Dyar emerged from 28th April to 10th May, 1901, and were almost immaculate, only a very few of the males having a few dots, Nos. 29-33 showing the range of variation.

The result of this brood proves that a spring brood may be quite as lightly marked as the most lightly marked summer brood, and it is probable that the influence of the parents is a potent factor in determining the result, but that, other things being equal, a spring brood will be more heavily marked than a summer one, was demonstrated in the most remarkable manner in brood A.

I have already mentioned that very few of this brood emerged in July and August, 1900, the great bulk of the brood going over the winter, thus showing the tendency of the double brooded *Cunea* of the South to become a single brooded moth in the latitude of Montreal.

The contrast in this brood between the summer emerging moths and those which passed the winter in the pupal state was most marked, as many of the males were heavily spotted, though some of the males and nearly all the females were immaculate, only one or two of the females being lightly spotted, Nos. 17-22 showing the range of variation in the spring part of brood A.

As already mentioned, nearly all of brood B had emerged in July and August, 1900, but three or four emerged in the spring of 1901, and No. 28 is a male of that brood which went over winter, showing the same tendency to heavy marking in the spring brood, and this fact has a very strong bearing upon the question of the specific distinctness of these two forms, for if both belonged to one species, *Textor* having only a spring brood in this region, should be a spotted form instead of being an immaculate one.

In the summer of 1900, I also secured part of a brood of *H. Textor* larvæ on Montreal Mountain, and sent a portion to Dr. Dyar, but he did not succeed in getting any through. I was successful with those I retained, but, curiously enough, a few emerged in the autumn, but those which emerged in the spring came out a little later than the *Cuneas* of brood A.

The latter emerged between the 5th and 15th May, with one belated one on the 20th, and another on 26th, while the *Textors* did not begin to appear till the 19th May, and came out between that date and 2nd June. Dr. Dyar succeeded with the portion of brood AB which I sent him, but, unfortunately, I did not with the ones I retained. They, were I fear, confined too long in a glass jar, and so became unhealthy before being transferred to a cage, and died off shortly after I left on my second trip to England, so here again we were unable to compare results.

A very important point which I brought out in my experiments was the refusal of *Cunea* and *Textor* to mate. At least three times was the experiment tried, when conditions were favourable, both moths being freshly emerged, but always with the same result, although they were left together for days. That no mating took place, I am positive, as close watch was kept at frequent intervals, and in a mating of *Cunea* which was timed, copulation continued from about 11 p. m. till about 8 p. m. the following evening. The *Cuneas*, however, mated all too readily among themselves.

To sum up the results of my experiments extending from the summer of 1899 to the spring of 1901, I find :

1st. That *Hyphantria Cunea* varies in both sexes from heavily spotted to absolutely immaculate.

2nd. That *Hyphantria Textor* is invariably immaculate.

3rd. That the two forms differ markedly and constantly in the larval state, while *Cunea* especially varies within its own range.

4th. That the two forms will not mate.

5th. That, other things being equal, the spring brood of *Cunea* is more heavily marked than the summer brood.

6th. That in the north *Cunea* tends to become a single brooded, heavily marked form.

I therefore contend that my results prove beyond reasonable doubt that we have two valid species, though in the imago stage it is impossible to distinguish between an immaculate *Cunea* and a *Textor*, and that the name given by Harris should therefore be restored to full specific rank.

Now, as to the synonymy, in Neumoegen & Dyar's "Preliminary Revision,'* the name Var. *Budea* Hübner was used for *Textor*, but this reference was evidently founded on a misapprehension as Hübner's figure shows a moth with a single dot on each fore wing, exactly as in fig. 14 of my plate, and the description mentions this spot, as I am now informed by Dr. Dyar.

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*Journal N. Y. Ent. Soc. I. 178.

The species should therefore stand as follows :

Hyphantria. Harris.
Cunea, Drury. (*Bombyx*).
Punctatissima, Abbot & Smith. (*Phalæna*).
Budea, Hübner. (*Cycnia*).
Mutans, Walker. (*Spilosoma*).
Punctata, Fitch. (*Hyphantria*).
Ab. var. Pallida, Packard. (*Arctia*).
Textor, Harris. (*Arctia*).
? Candida, Walker. (*Spilosoma*).

I have referred *Candida* Walker doubtfully as a synonym of *Textor*, as it is impossible to be sure that the type was not merely an immaculate *Cunea*, unless it could be shown to have come from a locality where *Textor* occurs and *Cunea* does not.

Figure 12 on the plate is shown as agreeing with almost absolute exactness with Drury's figure of *Cunea*, and Figure 23 as the nearest specimen to the very aberrant type of *Arctia Pallida* Pack. which I have been able to obtain. Sir George Hampson, in Vol. III of his work on the moths of the world, refers to Hyphantria the species described by Grote as *Alexicles Aspersa*, but as he admits the species is unknown to him, I consider the reference at least doubtful.

In the following summary I have endeavored to classify the individuals of the different broods, but any such classification is artificial, and merely approximate, as they merge by the slightest possible gradations from one extreme to the other.

SUMMARY.

Brood.	No. 1.	A.		B.		Dyar's.
Emerged.	Spring.	Summer.	Spring.	Summer.	Spring.	Spring.
Heavily Spotted						
♂	7	....	5	....	....	....
♀	3	....	....	....	....	....
Well Spotted						
♂	14	....	14	....	1	....
♀	13	....	....	....	....	....
Lightly Spotted						
♂	2	....	21	3	....	....
♀	9	....	1	....	....	....
Traces of Spots						
♂	0	5	9	9	....	10
♀	7	0	6	....	....	....
Immaculate						
♂	0	6	12	21	....	14
♀	4	6	45	17	2	22

Before concluding, I desire to acknowledge the kindness of Dr. Dyar, not only in supplying me with the necessary eggs and larvæ of *Cunea*, but also in carrying on similar experiments at Washington, breeding over 600 moths, the results of which I am permitted to give in the annexed Appendix, and which tend to confirm my conclusions.

I may also say that I learned through Dr. Dyar that Mr. Theodore Pergande had, from his own observations, become convinced that there were two species, the one varying from spotted to white, and the other always white, but differing in the larval state, just as my experiments have shown that they do.

To be the means of proving the correctness of a name given by Dr. Harris, for whom I have such a profound respect, is a source of gratification.

EXPLANATION OF PLATE.—(See frontispiece).

No. 1. ♀ parent of brood No. 1.

No. 2-6. ♂ ♂ brood No. 1 emerged March-May, 1900.

No. 7-11. ♀ ♀ brood No. 1. emerged March-April, 1900.

No. 12. ♂ from N. J. as close as possible to Drury's figure.

No. 13-15. ♂ ♂ brood A. emerged July-August, 1900.

No. 16. ♀ " " " "

No. 17-20. ♂ ♂ " " May, 1901.

No. 21-22. ♀ ♀ " " " ".

No. 23. ♂ similar to Packard's *Arctia Pallida.*

No. 24-26. ♂ ♂ brood B emerged end July, 1900.

No. 27. ♀ " " 5th August 1900.

No. 28. ♂ " " May 1901.

No. 29-31. ♂ ♂ Dyar's brood emerged May, 1901.

No. 32-33. ♀ ♀ " " emerged May, 1901.

APPENDIX.

Results obtained at Washington, by Dr. H. G. Dyar in carrying on parallel experiments 1900-1901.

SUMMER MOTHS.

Brood

D 1* Eggs on sycamore, Washington, D. C., June 1, 1900. No moths.

D 2* On pear, Hollydale, Pa., May 24th, 1900. Bred at Washington, D. C., 23 moths (13 ♂ 10 ♀) white, 4 ♂ with traces of spots.

D 3* On Sycamore, Washington, D. C., June 1, 1900. 36 moths in July-August (19 ♂ 17 ♀) white, 3 ♂ slightly, 1 ♂ distinctly spotted.

D 4* On Sycamore, Washington, D. C., in stage II, May 29, 1900. Moths in August, 90 moths (43 ♂ 47 ♀) white, 3 ♂ with traces of spots.

D 5* On Sycamore, Washington, D.C., June 1, 1900. Moths in August, 4 moths (1 ♂ 3 ♀) white.

D 6* On Sycamore, Washington, D. C,, June 1, 1900. Moths in August, 145 moths (77 ♂ 68 ♀) white, 3 ♂ with traces of spots.

D 7* Eggs from ♀ on Sycamore, Washington, D. C., hatched June 11, other broods in stages III and IV at the time. Moths in August, 204 moths (103 ♂ 101 ♀) white. 6 ♂ with faint grayish spots.

D 8* On Mulberry, Montreal, Ga., (J, H. Heard), June 8, 1900. Moths in August, 7 ♀ white.

SPRING MOTHS.

D 9* Mating of moths of D 4 end of July, 1900, Moth 1 ♀ white April 24th 1901.

D 10* Mating of moths of D 7 August, 1900. Moths March 24–May 2, 1901, 28 moths (11 ♂ 17 ♀) ♂ all lightly spotted, ♀ all white.

D 11 Brood of H, Textor from H. H. L., Montreal, no moths.

D 12* Anothing mating of D 4 end of July, 1900, Moths March 28–May 4, 1901, 20 moths (5 ♂ 15 ♀) most of them spotted, none heavily, but 1 ♂ 5 ♀ white.

D 13* A mating of Mr. Lyman's broods A and B sent from Washington 30th May, 1900, and the larvæ of brood AB returned to Washington. Moths March 24–May 1, 1901, 46 moths (42 ♂ 4 ♀) Spotted, some heavily, 3 ♂ and 3 ♀ white.

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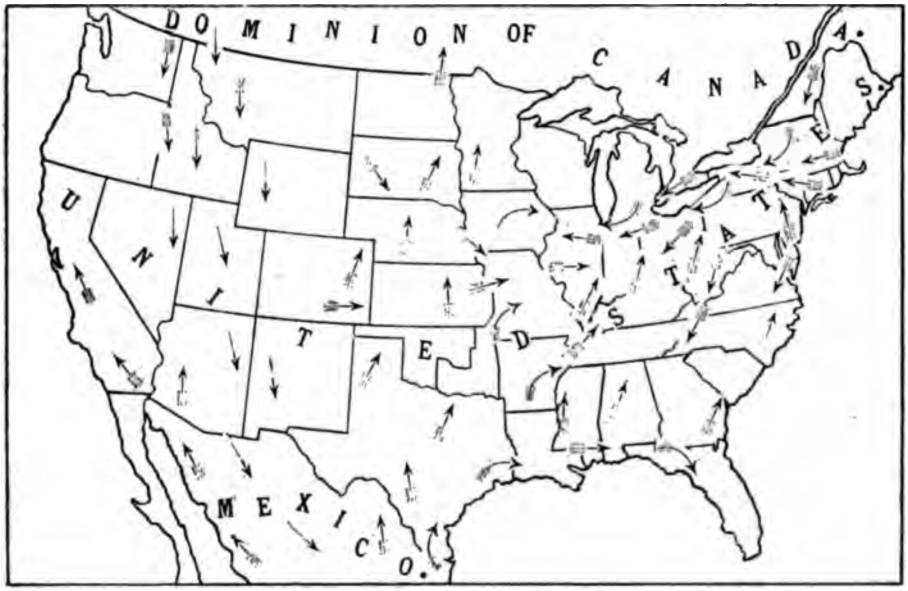
*Larvæ of *Cunea* type.

THE TREND OF INSECT DIFFUSION IN NORTH AMERICA.

By F. M. Webster, Wooster, O.

American entomologists have for many years been engaged in observing, defining and recording the distribution of species of insects and their progress, if of a migratory nature. In earlier days, when entomologists were few in number and widely scattered, there was little opportunity for serial observations or combined studies. But now, with entomologists in every State, the distribution of species can be more thoroughly studied and their movements, if such occur, carefully traced across State after State with surprising promptness and accuracy.

While it is not the object of this paper to gather up all the facts bearing on this subject that are scattered through our literature, it does seem proper, at this time, to sketch, tentatively at least the possible if not probable paths along which some insects, once unknown, but now common, have made their way to their present areas of habitation.



Map 1.—The Trend of Insect Diffusion in North America.—Webster.

Acquisitions to our insect fauna have come to us, almost exclusively from two sources, viz., either by introduction amongst articles of commerce or through natural influences, in the latter cases coming either from the north or the south, generally the latter.

The Appa'achian mountain system on the east and the Cordilleran mountain system on the west, while they do not prevent the introduction of foreign insects along our sea coasts, they do present more or less impassable barriers to the direct progress of such insects inland. In the case of the Cordilleras these appear to separate the northward flowing stream of tropical and sub-tropical species in its onward course, sending one portion along the Pacific coast and the other along the coast of the Gulf of Mexico, the latter sometimes spreading broadly inland, while the former holds more closely to the coast. The influence of the high plateau in Mexico on the eastern branch of this insect stream, will, some day, offer material for a most interesting study, even if it does not solve the problem of the evolution of several of our common insects. The Appalachian system does not approach the gulf coast at its southern terminus, but leaves a broad avenue that enables species moving eastward to pass on along the gulf to the Atlantic coast and thence northward. It does, however, to the northward form an almost impassable obstruction to the directly westward migration of insects from east to west, broken only in the State of New York and the country adjacent to the north and south shores of Lake Erie. Here we have a huge gateway through which nearly or quite all species imported from Europe, landing on our eastern seacoast, north of the mouth of the Potomac river at least, make their way into the comparatively level country beyond. It is barely possible that the valley of the Big Kanawka river in West Virginia and Cumberland Gap may offer passage ways for an occasional species, but of this we have no proof as yet. In the Cordilleran system there do not appear to be any such openings or gaps for the outflowing and spread of migrating species, except, perhaps, in extreme southern California and Arizona, a country so arid that few species can take advantage thereof, if it really exists, hence, a separation in South or Central America usually remains permanent, while in the case of the Appalachians, a species may work its way south along the Atlantic coast to the Gulf, and in a comparatively short time mingle with the northern branch that has made its way west to the great lakes and thence southward.

Besides these, there are paths of migration from the north southward, but these are confined to the two mountain systems now under discussion.

I will now take up each of these paths or trails of migration and give a few illustrations to make my points more intelligible. (See Map 1.)

The imported cabbage butterfly, *Pieris rapæ*, as is well known, was first observed in the vicinity of Quebec in 1860. From here it gradually spread south into New England and west through New York, so that it actually invaded Canada from the United States in 1872, and a year later, *in the spring of 1873*, it appeared at Cleveland, Ohio, in limited numbers.[1]

Many years ago one of the Dung beetles, *Aphodius fossor* L., which occurs in Europe, was introduced into the same section of country as the preceding, and like it spread southward into New England, and is now only being found occasionally in northeastern Ohio, though it was included in the list of Lake Superior species in 1878 by Hubbard and Schwarz, but not in the 1880 list of Reinecke and Zesch of species found within 15 miles of Buffalo, New York. In this case it evidently spread faster through Canada, but came to Ohio by the way of western New York.

The Asparagus beetle, *Crioceris asparagi*, introduced from Europe many years ago, first appeared in Ohio in the northeastern portion of the state, precisely as it made its way into Canada by way of western New York. *Crioceris 12-punctatus* has not yet been found in the State of Ohio but is to be expected within a year or two.

The clover leaf weevil, *Phytonomus punctatus*, and the clover root borer, *Hylastes obscurus*, both imported from Europe and both first coming to notice in western central New York, were first reported in Ohio in the northeastern counties. It is true that a single specimen of the former was taken from the *crop of a crow shot in Michigan in 1892.*[2] Yet had it invaded the State of Ohio from that direction the fact would have been shown by its presence in the clover fields of the farmer. I found it abundantly at Chautauqua Lake, New York, in August, 1888, and it must have entered Ohio a year, or at most two, afterwards. It is true that Mr. Dury found it near Cincinnati in 1892 and Mr. Hine in Lucas County the following year, but it did not become noticeably abundant until long after the farmers in northeastern Ohio were complaining of its attacking clover. The *Hylastes* also was found about Cincinnati soon after its appearance in northeastern Ohio, but like the *Phytonomus* it was probably carried into some of the tributaries of the Ohio river, possibly in northeastern Ohio, during the high waters of spring and down stream, being left by the receding water with driftwood and other debris, far back among the cultivated lands along the river itself.

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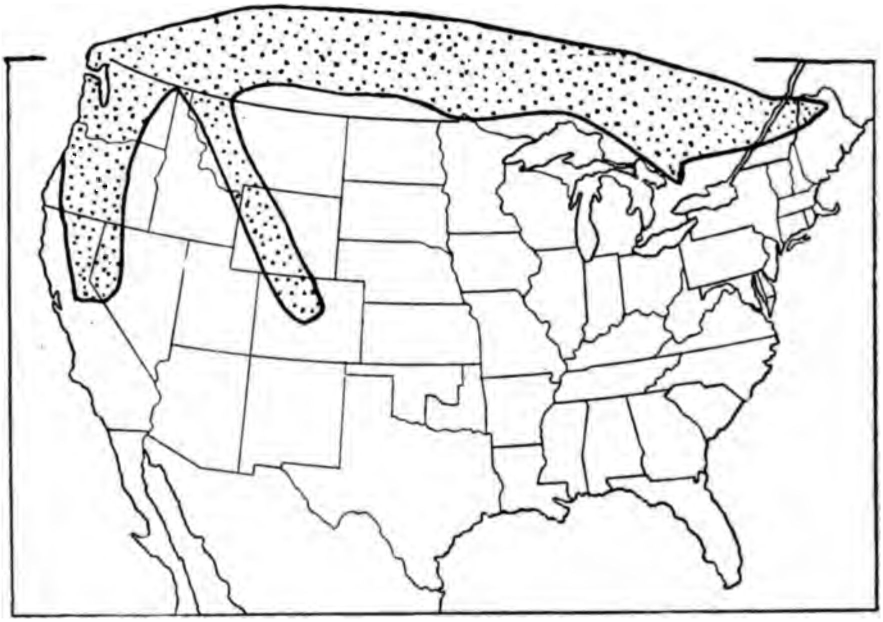
[1] Scudder The introduction and spread of *Pieris rapæ* in North America, 1860-1885. Mem. Bos. Soc. Nat. Hist. Vol. IV., No. III.

[2] *The Common Crow of the U.S., Burrows and Schwarz*: Bull. 6, U. S. Dep. Agr. Div. Ornithology and Mammology.

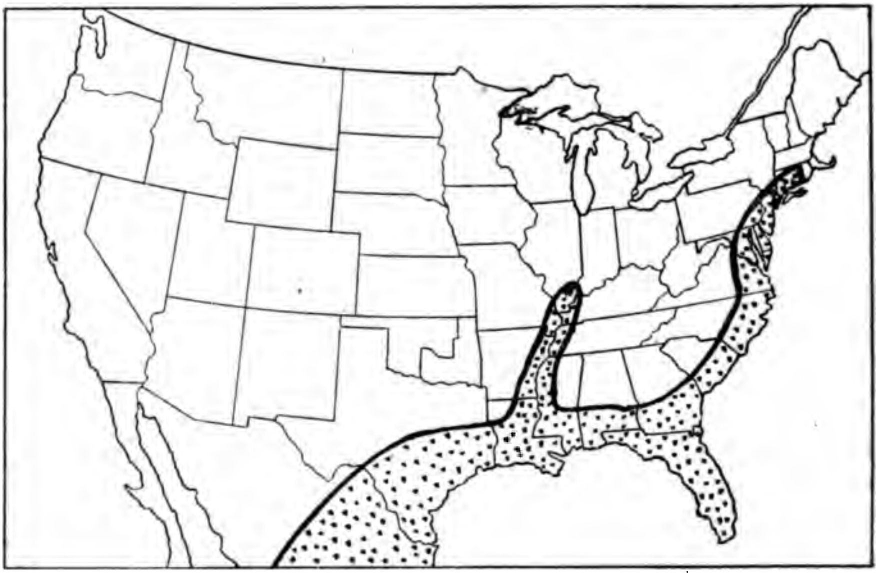
Even the Horn Fly, *Hæmatobia serrata*, was first reported in the State at a point some thirty miles east of Cleveland, though it appeared elsewhere soon after, and now we have another illustration in the Willow and Poplar Curculio, *Cryptorhynchus lapathi*, found at Ashtabula in the extreme northeastern county within a few weeks. This last appeared about Buffalo, New York, in 1896.

The foregoing illustrations will, I think, show clearly that there is a gateway opening into Canada between the east end of Lake Erie and the western end of Lake Ontario as wide as the Niagara River is long, through which insects introduced from Europe make their way, frequently even when such have been first introduced into Quebec, seemingly preferring to make their way westward to the south of Lake Ontario instead of to the north of it. The gateway on the United States side is along the south shore of Lake Erie, and between it and the northern terminus of the Alleghany mountains.



MAP 2.—The dotted area shows territory over which *Erynnis Manitoba*, the Canadian Skipper Butterfly, occurs and illustrates the southern trend of northern species. (Adapted from Scudder.)

The eastward trend of insect migration is followed, either by species whose native habitat is along the foothills of the Rocky Mountains, or else by such as have come up from the far south and swayed broadly to the eastward across northern Missouri, Iowa and possibly southern Minnesota. The spread of the Colorado Potato beetle, *Doryphora 10-lineata*, is a good illustration, while the Box Alder bug, *Leptocoris trivittatus*, which is slowly but surely making its way eastward, having, as Dr. Forbes informs me, reached eastern Illinois, is another example. Of those that have come up from the far south and fallen into this trend of migration, probably *Diabrotica longicornis* will offer the best illustration, and this will lead me to the discussion of the northward spread of tropical and sub-tropical species. This species was first observed along the eastern slope of the Rocky Mountains, and up to within the last thirty-five years was a comparatively rare insect, found in summer on the blossoms of golden-rod and thistles, and probably occurred, locally, far to the eastward, possibly reaching the Atlantic coast within the last twenty-five years. The writer can well remember when it was of uncommon occurrence in northern Illinois, where now it literally swarms, under certain conditions of Indian corn culture, to which crop it has come to be a veritable pest. Somewhere in the great corn fields of Illinois and perhaps Iowa, this insect acquired the habit of breeding in the roots of corn, and what seems to be a corn feeding race has sprung up and has slowly made its way eastward, having now reached the eastern half of Ohio. As illustrating this feature of its diffusion, while I have been closely watching its progress in western Ohio, I was unable for ten years to find a single individual about Wooster, situated about 65 miles from the eastern line of the State, and about 35 miles from Lake Erie. In the summer of 1900, however, I found a single individual in my garden on the common sunflower, and, judging from past experience in other States as well as in western Ohio, we shall soon have the insect in abundance. Elsewhere* I have discussed the diffusion of the genus at considerable length, and it is unnecessary to repeat here what was there stated, except to again call attention to the fact that our *D. vittata* has a very close relative in *D. trivittata* on the Pacific coast and that our *D. 12-punctata* has an equally near relative in the *D. soror*, also of the Pacific coast, while each has an intermediate species that seems to connect the two in each case. This phenomenon I attribute to the fact that the original stem species may have become separated far to the south, and one branch followed the western slope and the other the eastern, Prof. Cockerell's *D. vittata* var., *incerta* coming between the former and *D. trivittata*, would seem to give us an illustration of an intermediate species in the process of evolution, while in *D. tricincta*, which occupies a similar relation to *D. 12-punctata* and *D. soror*, the evolution has advanced further and we have what we term a good species. From some more recent studies of *Myochrous denticollis* and allied species of that genus, it would seem that something similar might have taken place with reference to that species as well†.



MAP 3.—The dotted area shows the territory over which *Lerema accius*, the Clouded Skipper Butterfly, occurs. This is the area covered by the northern trend of southern species. (Adapted from Scudder.)

The southern terminus of the Appalachian system has a similar effect in dividing the streams of insect migration, after such have passed to the eastward along the gulf coast, one branch keeping along the Atlantic coast and the other to the west of the mountains, but without any such influences on the species as seemingly occurs in Central America and Mexico. Thus, there is no perceivable difference between the *Dynastes tityus* that breeds in the southern portions of Illinois, Indiana and Ohio, and those found some distance up the Hudson River in New York. The same is also true of the Bag Worm, *Thyridopteryx ephemeræformis*, which along the sea coast extends northward to Massachusetts, and in the west it has been sent me from within twenty-five miles of Lake Erie, though it is but fair to say that this was in case of a single sack, the species not occuring abundantly north of Columbus, in this State, and, until quite recently, it was not to be found even that far north, yet there is no apparent difference between Ohio and Massachusetts specimens, so far as I have been able to learn. The chinch bug, *Blissus leucopterus*, may, perhaps seem to offer an exception in its abbreviated wings along the shores of the Atlantic, but as we have the same phenomenon in the same species on the Pacific coast, it would seem that it is due to maritime influences. If one will take almost any study of the distribution of our species of insects and examine it closely, he will be surprised at the number that extend their habitat south into Central and South America, and will get the impression that many of our species really extend from the tropical countries northward, instead of from north to south, as it is usually given by our systematists. A good illustration is afforded by a recent "Review of the Tettigonidæ of north America, north of Mexico," by Mr. Elmer D. Ball, who, after the common usage, gives the species as occuring from its northernmost known home south when in the cases of 19 out of 26 species considered, this statement should have been reversed. These illustrations only convey a limited idea of the wealth of material awaiting the student of the origin of our insect fauna.

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*Jour. N. Y. Ent. Soc., Vol. III, pp. 158-166; Vol. IV, p. 67.

†Loc. Cit., Vol. IX, p. 127.

There remains only one more tide of insect migration to consider and *that from the north* to the southward. Mr. Schwarz* has given two exceedingly good illustrations of this, one, *Aphodius rufipes*, which occurs all over Europe and Siberia, but in North America only in the Alleghany mountains; the other a Carabid, *Nomius pygmæus*, which is found in Oregon and Washington, Lake Superior, Ottawa, Canada, Nova Scotia, and on the high mountains of North Carolina. Our commonest lady beetle, *Megilla maculata*, is found as far south as Chili, though at sea level, a large and developed variety occuring in the *Amazon district* of South America.† Our *Pyrameis hunteri* has also been taken in Peru, at an altitude of 9,800 feet above the sea. The White Mountain Butterfly, *Œneis semidea*, as is well known, occurs in the White Mountains of New Hampshire, Labrador, and on the high mountains of Colorado. There are other equally interesting illustrations of this southward trend of arctic and boreal species, but I have not time to enumerate them. I will close this paper, however, by a significant statement made by Dr. Henry Skinner in the *Canadian Entomologist* of October, 1893, as follows: "In the species that fly from the Atlantic to the Pacific, and also exist in Europe, it will be found that the Pacific coast examples far more closely resemble European ones than those individuals found on the Atlantic slope."

THE IMPORTED WILLOW AND POPLAR CURCULIO.

Cryptorhynchus lapathi Linn.

By F. M. Webster.

My reason for treating this insect at considerable length at this time is, that it has passed the Alleghany Mountains and entered the middle west, having been found the present autumn near Ashtabula, in the extreme northeastern Ohio, by one of my assistants, Mr. A. F. Burgess, acting under my direction. Previous experience with imported insects that have made their way to the west, led me to believe that we should sooner or later find it in Ohio, and that it would first appear in that part of the State, therefore Mr. Burgess was instructed to search for it this fall as opportunity offered, and a single female was found in the act of ovipositing on Oct. 5th, in willow, growing along a small stream just east of the City of Ashtabula.

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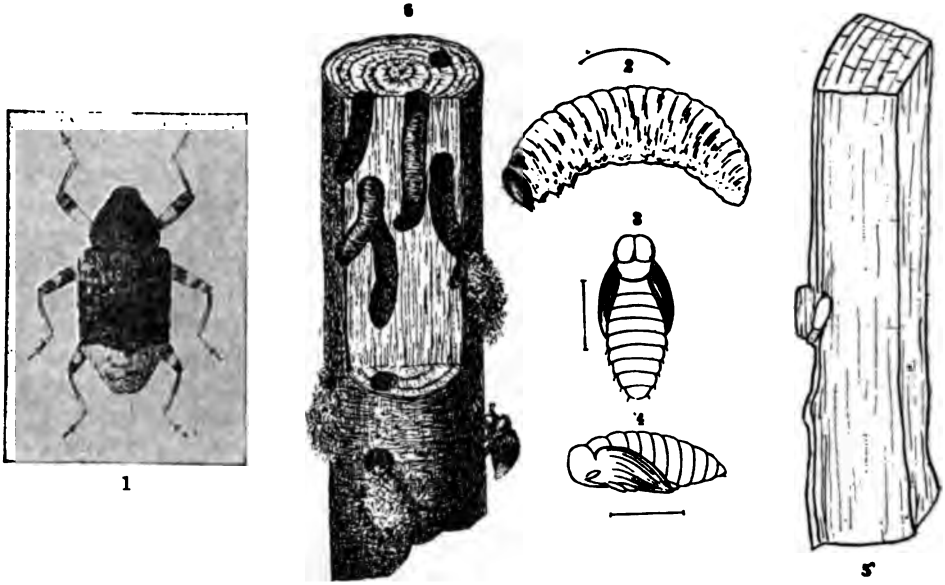
* Proc. Ent. Soc., Washington, Vol. I., p. 186.

† Travels Among the great Andes of the Equator, Appendix, p. 57.

Description of the Mature Insect.

The insect is one of the snout beetles or curculios, related to the plum curculio, but much larger, being from 6.5 to 7.5 mm., about one-third to three-eighths of an inch, in length ; body dull black with little spots or tufts of jet-black scales or hairs on the thorax and wing covers ; scattered over the forward half of the wing covers are minute white scales which almost cover the posterior third, and form a somewhat V-shaped marking between this and the thorax. The body is coarsely pitted, and the femora, or first joints of the legs are spined. Plate, Fig. 1.



The Imported Willow and Poplar Curculio.—(Webster.)

Figure 1, *Cryptorhynchus lapathi*, adult, enlarged. Original.
Figure 2, larva ; figures 3 and 4, pupa. After Jack.
Figure 5, egg enlarged, as placed by female in bark of willow. Original.
Figure 6, illustrating larvae burrowing in the solid wood. After Jack.

Description of the Larvæ or Young.

When fully developed these are fleshy, footless, whitish borers, having somewhat the appearance of grubs, with small brown heads and darker brown jaws. Plate, Fig. 2.

Distribution of the Species.

The insect is common in Europe, ranging over Siberia and Japan, but whether it extends further south into Central Asia is not known. In the United States it is known to occur from New Jersey to Massachusetts, and westward through New York and in north-eastern Ohio, having without doubt pushed its way along the south shores of Lake Erie, from Buffalo, N.Y., where it was first observed in the summer of 1896.

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HISTORY OF THE SPECIES IN OTHER LANDS.

The species was described by Linnæus in his "Systema Naturæ," in 1763, its habitat being given as Europe, and found on *Salix* and *Rumex*, willow and dock. Later, it received attention from Fabricius in his "Systema eleuteratarum, 1801; Syst. Entomologia, 1775; Spec. Insectorum, 1781; Entom. Systematica, 1792," and later by Zetterstedt, Mathieu and Kaltenbach. It is included in Turton's Linnæus, 1806, Vol. II., p. 231. Ratzeburg, in his "Die Forst-Insecten," 1839, p. 155, briefly characterizes the insect, and states that it takes its name from the large-leaved dock, Lapathum, of the ancients, on which it sometimes sits. In Silesia it is called the alder destroyer (Erlenwurger). In July, 1824, in the vicinity of Liegnitz, a whole alder plantation was destroyed by it, and even a large number of trees ready for cutting did not escape. Willows were also destroyed by it. Nordlinger, in "Nachtrage zu Ratzeburg's Forstinsekten," 1856, p. 15, says that, according to Herr Suffrian, it occurred on low willows four or five feet high at the bases of the branches, and also on these last, and in June and July it was found in great numbers at Hohenheim on Canadian poplars, and also on white willows, where it would remain for hours with its snout buried in the spongy linticels.

Herr Hahn, wood commissioner of the district of Laupheim, observed in the forest of Ochsenhauser, on a strip of land on which both deciduous and coniferous trees were growing, that the birches five to eight feet high were broken off about three feet below the top, and were hanging down. One inch below the break was a worm-hole filled with worm-dust and wood shavings, in each of which was found a yellowish white larva with a brown head, which, after from eight to fourteen days, developed into one of these curculios. Herr Hahn considered that in this case the insect had destroyed the growth of two years.

In 1867, Brehm and Rossmassler, in "Die Thiere des Waldes," Bd. II., p. 171, under the term "Der Erlenrusselkafer," state that they have only noticed the insect in the mountain region, where it constantly works on the white alder, *Alnus incana* L., hardly a bush along the brooks and forest borders being free from the pest, the branches and trunks attacked readily breaking off.

In 1868, Ratzeburg again takes up the species in his "Die Waldverderbniss," dealing with it much more thoroughly than he had been able to do in his previous writings, and calling attention to the observations of Zebe and Herr V. Kamptz, relative to the injuries done by the insect, the latter having observed the habits of the beetle in Mecklenberg-Strelitz for many years. He states that an annual generation is the rule, and hibernation, therefore, occurs in all stages, most seldom in the larval state. The point that the beetle prefers isolated trees and does not like a wet locality well, is repeated, but he is still reluctant in classing the black alder as a common food plant, though not doubting that it is one of the food plants. In 1869, in "Die Waldverderber," pp. 171, 172, he states that the eggs are laid in May, the normal season, usually on alders—the black rather than the white—much more rarely on poplars, birches and willows, and the beetle prefers the young shoots or branches two to three years old. He is seemingly much perplexed over the fact that, while the beetles pair and the females oviposit normally in May, they were also abundant in August.

In 1881, Dr. Bernard Altum. in "Forstzoologie," III. Bd. abth., p. 220, opens his discussion of the species by the interesting statement that there are 221 species of the genus *Cryptorhynchus*, distributed over the entire earth, while Taschenberg, in "Brehm's Tierleben Insekten," 9 Bd., p. 163, 1892, states that *C. lapathi* is the only European representative of a South American genus. I may add here that we have now 16 species inhabiting North America, north of Mexico, the majority of them inhabiting the southern or south-western States. Dr. Altum wrestles with the life history, and does not clear up the obscurity, but states that while the sexes pair and oviposit in May, they may be observed pairing in September. there being a noticeable falling off in point of numbers during July. He leaves the subject by allowing a two year generation; that is, covering a portion of two calendar years, but completing their life cycle within twelve months.

The life history is given as follows, as observed in Silesia. Here, again, the white alder was seemingly preferred. The larva first works flatways under the bark, and then goes straight, ascending into the wood. Fig. 6, Plate. The larva makes the first chamber under the bark the first summer, and af er hibernation begins to excavate its gallery into the sound wood, ascending as a steep passage—sometimes as a broken one—still directly into the sapwood, and before pupating the larva reverses its position and lies with its head downward in the burrow. Besides the white alder *Alnus incana*, black alder *A. glutinosa*, and of the willows, *Salix purpura*, *S. viminalis* and *S. triandra* are given as food plants, coupled with the statement that the willows along the railroads were badly injured, and in many places entirely destroyed by the ravages of this insect.

Judeich and Nitsche, in "Lehrbuch der Mitteleuropaischen Forstinsektenkunde," II. Abtheilung, 1889, deal at length with the insect, but do not clear up the obscurity in its life history, viz., do the beetles emerging in the fall come from eggs laid in the spring of the same year, or from those laid the preceding year? The eggs are, for the most part, deposited singly in the bark of young alders, both black and white, and willows, including, besides those previously mentioned, *Salix cuprea*, and the larvæ eating out a hollow space under the bark, later force their way upward and deep into the wood. In case of small growths they work only in the centre. Before pupation the larva turns head downwards and prefers to hibernate in the larval chamber, climbing down the chamber when ready to emerge, and eating out a round hole in the bark for exit, near the place where the larval injury began. In proof that the beetles do not hibernate outside, the observations of Taschenberg are cited, who observes that where its dwelling-places about Halle were flooded during the winter, it was never to be found among the floating reeds and underbrush.

Eckstein, in "Zeitschrift fur Forst-und Jagdwdsen," XXIII,, Bd 1891, p. 378, states that single willows in the forest botanical garden were attacked by this insect and badly injured. He also calls attention to the fact that, in badly infested stems, the larvæ frequently take a descending course instead of an ascending one, and also that the beetle does not gnaw a separate exit after leaving the pupal chamber, but follows the larval gallery, and makes its exit through openings made by external agencies.

Taschenberg, "Brehm's Tierleben, Insekten," 9 Bd., p. 163, 1892, states that on the banks of the Saal, near Halle, the larvæ live in the old gnarled root-stocks of the basket willows, causing these to die gradually, earlier than they would otherwise have done, and that in alder nurseries the larvæ do serious damage, and that they destroy plantations of young birch. Tubeuf, in "Forstlich-Naturwissenschaftliche Zeitschrift," I. Jahrgang, p. 387, adds the Alpine alder, *Alnus viridis*, to the list of food plants of the species, and finds fully developed beetles in the burrows in September, where the weather is cold and it frequently snows during that month.

HISTORY OF THE SPECIES IN AMERICA.

The first published record of the occurrence of the insect in America is by William Juelich, in "Entomologica Americana," Vol. III., p. 123, 1887. Mr. Juelich, early in June of that year, took a section of willow that had been blown down near West Bergen, New Jersey, and from it on July 3rd there emerged two adults, and later he succeeded in getting ten more from pieces of the same willow. He states also that he had, five years before (1882), collected a single specimen on willow near Williamsbridge, about twelve miles from where he secured his pieces of willow from which he reared the later specimens, and also that Mr. Ottomar Dietz had taken a specimen on Staten Island. From the pieces of willow Mr. Juelich also reared three specimens of an Ichneumon, *Ephialtes irritator* Fab., and, as no trace of other insects inhabitating the pieces of willow could be found, it was presumed that the Ichneumon was a parasite on the beetle. In the "Canadian Entomologist," Vol. XXIII., p. 221, 1891, Prof. John B. Smith stated that nearly all of the clumps of willows near Arlington and Newark, New Jersey, and also some fancy garden trees had been killed by the insect. The next published notice is by myself in "Journal of the New York Entomological Society," Vol. V., p. 30, March, 1897. In company with Mr. Ottomar Reinecke, of Buffalo, I had, on August 24th of the preceding year, taken the insect in considerable numbers near that city, where it had only just been discovered by Mr. Reinecke. Dr. A. D. Hopkins, of Morgantown, W. Va., also accompanied us, and larvæ (Plate, fig. 2), pupæ (figs. 3 and 4) and adults (fig. 1) were all secured. My beetles were collected in a cyanide bottle, strongly charged and freshly made. The beetles remained in this bottle some six or seven hours, when they were removed and placed in small tin boxes. The following morning, the 25th, they gave no signs of life, but after I had returned home, on the 29th, not only were all of them found alive when I opened the box, but several of them were pairing. They were then placed on willow, but, though they did a large amount of puncturing, and would remain for hours with their snouts embedded in the bark, as has been observed in Europe, I was not able to secure a single egg, though some of the beetles survived until early in November (loc. cit., p. 204).

The next contribution to American literature relative to the pest, is by Mr. J. G. Jack, of the Arnold Arboretum, in "Garden and Forest," Vol. X , p. 394, October, 1897. Mr. Jack states that the insect had been known about Boston and Cambridge, Massachusetts, for many years, and for several years had been destructive to almost all species of willows growing in the Arboretum. It had been found burrowing in nearly all of the native willows except a few mountain or very slender stemed species, too small to afford sufficient tissue in which to excavate their chambers or feed freely. (Plate fig. 6.) Of the foreign species of willows, the white willow, cracked willow and laurel leaved willow, were all affected, but less seriously than the Babylonian weeping willow. All of the species of poplar in the Arboretum, particularly while young, had been attacked, and to a less extent the dwarf birch, *Betula pumila*, and the Red River birch, *B. nigra*. So abundant was the pest, and so extensive its ravages, that it was hardly possible to find a good healthy plant among the scrubby willows about Boston. The beetles were found on the bark, and sometimes on the foliage, in July and August. Other information is given, taken from European authors.

In "Psyche," Vol. VIII., p. 371, June, 1899, Mr. A. H. Kirkland calls attention to the fact that, about some of the shore towns in eastern Massachusetts, this insect has become a serious enemy to the Balm of Gilead trees, which, on account of the somewhat marshy land, constituted by far the most common shade tree, and so great was the injury that at that time it was almost impossible to find a sound tree of this species, all having been weakened by the attacks of this borer, and later broken down by the ice storms and high gales. Serious damage in nurseries is also recorded. Mr. Kirkland began in June, 1897, a study of the life history of the species in this country, and as he has very kindly placed his notes in my hands for use in the preparation of this paper, I take pleasure not only in appending them herewith, but in thanking him most heartily for allowing me to use them. I am also further indebted to Mr. Kirkland for translations of the European authors from which I have so freely drawn. The notes just mentioned are as follows :—

June 30, 1897. Larvae abundant at Winthrop, Massachusetts, boring in Balm of Gilead trees ; larvae nearly full grown, and some forming cells to pupate. Before pupating they enlarge their burrows to the outlet, then retreat to the upper end and transform in a neat chamber. 57 larvae taken from a stick 1½ inches in diameter, and 2 feet long.

July 3, 1897. Larvae common at Saugus, Massachusetts, in our native trembling poplar.

July 4, 1897.	Many small beetles (*Ips fasciatus* and its allies) abundant in filth which oozes from the burrows.
July 14, 1897.	From the middle of June to the middle of July sap flows freely from exits of burrows. Pupa always headed towards exit. Large infested branches wilt and die.
July 22, 1897.	In infested branches taken June 30th, beetles are matured to-day. I split open branches every day from June 30th on, and found nearly all the larvae pupated July 3rd and 4th. Eighteen days will pretty closely cover the length of pupal stage.
July 28, 1897.	Plenty of beetles in the infested sticks and only one pupa found. But few of the beetles have emerged from the burrows as yet.
July 31, 1897.	Beetles emerging freely.
August 17, 1897.	Beetles common. Feeding on petioles and poplar leaves.
May 22, 1898.	Captured one imago at Medford. Probably an over-wintered specimen.
May 29, 1898.	Found plenty of larvae in native willows at Medford. This shows that the insect breeds in our woodlands
June 6, 1898.	Larvae are feeding rapidly and throwing out worm-dust from their burrows.
June 15, 1898.	Larvae boring in *Populus monilifera*, at Bedford, Massachusetts.
June 27, 1898.	Larvae nearly full grown.
July 5, 1898	Beetles mating at Medford.
July 10, 1898.	Larvae beginning to pupate, the date being later than last year. The small larvae hibernate in the cambium, enter the wood in the spring, and make a rapid growth to maturity. The base of young trees is a favorite point of attack ; older trees are more difficult to affect.
July 16, 1898.	Found larvae boring in silver poplar (*Boliana poplar*).
July 30, 1898.	Beetles abundant at Springfield, Massachusetts, along the Connecticut River ; feeding on the cotton wood.
September 15, 1898.	Imagoes mating at Malden.
September 21, 1898.	Beetles abundant and feeding on petioles and young twigs, at Winthrop, Massachusetts.
April 5, 1899.	Found minute larvae under leaf scars in poplars at Abington, Massachusetts. Larvae $\frac{1}{16}$th of an inch long, curved, pale greenish, and only slightly active.
May 10, 1899.	Young larvae abundant in bark beneath leaf scars on poplars at Winthrop. Burrows about one inch long now mainly in the bark, and full of black castings.
May 18, 1899.	Larvae now entering the wood, having finished feeding in the bark.
June 4, 1899.	Larvae 7 to 10 mm. long and feeding rapidly.
October 2, 1899.	Found eggs of this insect for the first time, in poplars, at Wyman's Nurseries at Abington. They were wedged in under the bark in cavities at the base of young branches. The beetle gouges out a hole for each egg, and leaves from one to four in a spot. In some of the infested sticks the eggs have hatched and the tiny larvae have commenced feeding. This finding of the eggs closes the gap in the life history of the insect.

Unless there are adults in spring, which, as in Europe, deposit eggs in May, and Mr. Kirkland overlooked those, which is hardly possible, he has given the full life history, for the first time. It is possible that the single annual brood is not, as seems to be the case in Europe, intercepted by winter. Certain it was that the insect was pairing at Buffalo, N.Y., August 24th, 1896, and ovipositing at Ashtabula, O., on October 5th, 1901, though in this latter case it might have been by a belated female. Mr. Burgess examined many poplars in the city of Ashtabula without finding the insect, and but a single female was to be found on the willows in a deep ravine near the city. This female was observed in the act of oviposition, the place selected by her being one of the corky growths, common on the willow bark. The day was cool, and the beetle worked on the south side of the tree, pushing her snout into the corky bark as far as it would extend, and worked it about so that quite a cavity was excavated. She was thus engaged when found, and continued to work for forty minutes. At the end of this time she reversed her position, and, placing her ovipositor in the cavity, forced it in the entire length, her position at the time being parallel to the ground. After remaining motionless for three minutes she began to move the abdomen and ovipositor upward and downward, and, though something could be observed passing into the cavity, whether the egg or some mucilaginous matter could not be determined, but in any case, when she had finished her work the cavity was completely closed. Turning about again she seemed to examine her work with snout and antenna, and, apparently satisfied therewith, she sought out another similar corky growth and began her work when she was captured, remaining alive, however, until October 10th. The section of willow showing the egg as it was placed by the insect is shown by fig. 5, plate. It will be noticed that it was jammed into place, and probably packed securely with the surrounding tissue, reduced to pulp by the jaws of the beetle.

The egg is oval, pale yellowish white ; length, 1.5 mm.; width, 0.8 mm.

It would appear from the foregoing that this insect has come among us to attack our willows, poplars and probably some other shade and ornamental trees that are found in our parks, cemeteries and other public grounds, as well as along our streets ; also, that it is a nursery pest as well. The Carolina poplar, on account of its symmetrical form and rapid growth, has been very largely planted during the last ten years, and it remains to be seen what effect this foreign insect will have upon these, especially as Mr. Kirkland informs me that, at present, the species is a serious pest in nurseries where poplars and willows are propagated, and on low lands where these are the principal shade trees.

PREVENTION.

If, as now seems to be the case, the insects live over in the bark as very young larvae, it will be difficult to detect their presence until the next summer, so that burning infested trees in winter will be impracticable, as the presence of the borer will only show after the injury has been done and the culprit escaped. Something may be accomplished by burning in late spring such trees as are seen to be infested, thus destroying the pest before it develops and escapes. The outlook, however, is not encouraging in the matter of protecting trees from attack.

THE COMMON CHEESE MITE, TYROGLYPHUS SIRO, LIVING IN SPOROTRICHUM GLOBULIFERUM.*

By F. M. WEBSTER.

Since the year 1896 I have been distributing from one hundred to several thousand small boxes of this fungus each year to farmers in Ohio, to be used against the chinch bug, *Blissus leucopterus*.

In the preparation of this fungus for distribution, we have followed the more recent method of cultivating it in quantity on a base of sterilized beef broth and corn meal, but recently an unexpected difficulty has arisen in the shape of the ravages of the common cheese mite, which makes its way into the boxes of the prepared material, after it has been dried and put away for use, and reduces the contents of the boxes to powder, so that it is simply a crawling mass.

Curiously enough, despite the attack of these mites, one of my assistants, Mr. Newell, took a quantity of this mass of powdered meal and mites and with this was enabled to get a fine culture in a bottle of the sterilized meal and broth dough.

The mite attacks not only cheese but sugar, flour, cured hams, wool, seeds and many other articles of food and commerce. Evidently it is in this case the dough that attracts them, but as against them this species of entomogenous fungi is clearly harmless.

THE HIBERNATION OF INSECTS.

By Prof. W. Lochhead, Ontario Agricultural College.

A very puzzling question, yet a very important one, is frequently asked : "Why do some insects pass the winter as adults ; some as pupae ; some as larvae ; and others in the egg stage ?"

To answer this question the entire history of the development of insects would require to be known, for there seems to be but little doubt that the particular hibernation form is the visible expression of the influence of many factors, such as change of environment, nature and abundance of food, and change of habit. The question of hibernation is clearly closely associated with that of metamorphosis, and any intelligent discussion of hibernation must necessarily deal with the causes of metamorphosis. When this connection is realized, it is plain that in dealing with hibernation forms of insects we are dealing with one of the most difficult problems in biology. No attempt will be made here to solve the difficulty, but, perhaps, the presentation of a few facts regarding hibernation forms may be useful and interesting.

The members of the order *Orthoptera*, almost without exception, hibernate in the egg stage; the *Hemiptera* mainly in the egg, or adult condition ; the *Neuroptera* as larvae ; the *Lepidoptera* in the egg, larval, pupal, or adult condition ; the *Coleoptera* as pupae or adults ; the *Hymenoptera* as larvae or pupae ; the *Diptera* as larvae, pupae, or adults.

According to the foregoing, it would appear that the insects that pass through an incomplete metamorphosis have but one, or at most two, forms of hibernation, while the insects which pass through a complete metamorphosis have several forms of hibernation.

When we remember that the modifications in the stages of metamorphosis are modifications in the form and functions of organs in adaptation to a changed environment, it becomes evident that the insect may winter over in any one of the four stages. That stage will be chosen which will suffer least by the change of environment. For example, in those forms whose larval existence is spent in semi-liquid decomposing matter, it would be practically disastrous for them to remain as larvae, when intense cold sets in and changes the condition of the medium. They are more likely to survive as pupae, or adults, in a dry medium.

With reference to metamorphosis, insects are divided into the *Hemimetabola*, or those with an incomplete metamorphosis, and the *Holometabola*, or those with a complete metamorphosis. In the former there is a gradual change from the larva to the perfect insect, while in the latter the insects pass through a resting pupal stage.

With regard to the stages of development, some of them show better adaptation to hibernation than others, although it is impossible at present to explain why some butterflies winter over in the adult state and others in the chrysalis ; or why some flies winter over in the larval state, some in the pupal, and others in the adult.

Brief notes of the stages will be given here beginning with the Egg, dwelling chiefly on characters which enable the insect to hibernate.

The Eggs. Eggs of insects are protected by two coats or membranes, an inner *vitelline* membrane, and an outer *chorion*, composed of two layers. When eggs are laid in situations *exposed* to the weather and cold, the shell, or chorion, is very solid, and sometimes strengthened by ribs and ridges. Within the coats of the egg are the yolk-mass and the germinal vesicle, which lies within the yolk-mass. The amount of yolk-mass is usually large, and it is claimed by Brauer that the eggs of insects which undergo incomplete metamorphosis contain relatively more yolk than those of insects with complete metamorphosis. As the germinal vesicle lies within the yolk, it is securely protected against changes of temperature and moisture, as the yolk is mainly composed of fat globules. The eggs of some insects possess remarkable vitality, such as those of the "Walking Stick," and Bittacus, which survive two or more years.

Naturally, then, we might expect to find some insects in all the Orders hibernating in the egg state. The following common forms winter as eggs :—

Plant-lice (*Aphididae*).
Tree-Hoopers (*Membracidae*).
Leaf-Hoppers (*Jassidae*).
Most Scale Insects (*Coccidae*).
Leaf-bugs (*Capsidae*).
Grass-hoppers (*Acrididae*).
Locusts (*Locustidae*).
Crickets (*Gryllidae*).
Walking-Sticks (*Phasmidae*).
Gipsy Moths (*Ocneria dispar*).
Fall Canker Worm (*Palaeacrita pometaria*).
Tussock Moth (*Orgyia leucostigma*).
Tent-Caterpillars (*Clisiocampa Americana*, and *C. disstria*) (fig. 33).

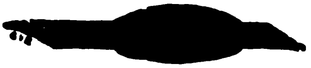

Fig. 33. Egg-cluster of Tent Caterpillar.

The Larvae. Insect larvae differ from the immature forms of other invertebrates in the possession of the systems of organs and the same number of segments in the head, thoax, and abdomen. When ready to pupate the larvae are always larger than the adults.

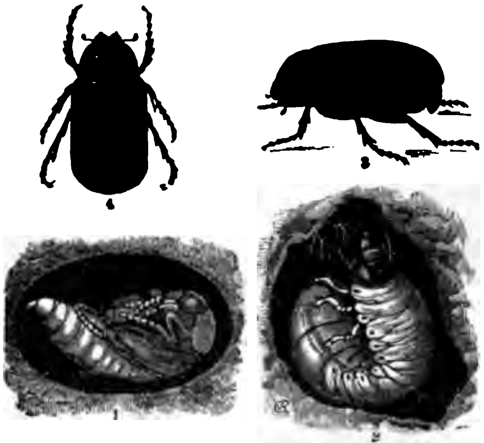

Fig. 36. Lachnosterna. 1. Pupa; 2. "White Grub"; 3 and 4. Beetle.

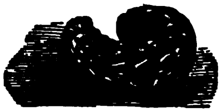

Fig. 34. Cut-Worm.

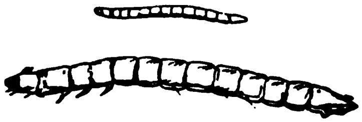

Fig. 35. Wire-Worms.

From the fact that the larval stage is the growing time of the insect it is not to be expected that hibernating larvæ will often occur. Moreover, the relatively large amount of fluids within the body of the larvæ, and the thin dermis just after moulting, make them extremely sensitive and liable to injury from freezing and other temperature changes.

Some insects, however, do hibernate as larvæ, but these are all protected in the ground, and in the mud at the bottom of ponds, or in specially constructed cocoons, or other covering. The following insects hibernate as larvæ :

Codling Worm (*Carpocapsa pomonella*).
Bud-Moth Caterpillar (*Tmetocera ocellana*).
Most Cut-Worms (*Noctuidæ*), Fig 34.
Peach-Tree Borer (*Sannina exitiosa*).
Blister-Beetles (*Epicauta Pennsylvanica E. vittata, E. cinerea*).
Joint-Worms (*Isosoma tritici*).
Hessian Fly (*Cecidomyia destructor*). as "Flax-seed."
Ichneumon-Fly (*Ichneumonidæ*).
Ant-Lions (*Hemerobiidæ*).
Wire-Worms (*Elateridæ*), Fig. 35.
White Grubs (*Lachnosterna fusca*)., Fig. 36.
San José Scale (*Aspidiotus perniciosus*).
Crambus Moth (*Crambidæ*).

The Pupæ. True pupæ only occur among insects which undergo complete metamorphosis. As the pupal period is the resting, inactive stage, when no food is taken, and when the pupa itself is protected by a thick, chitinous, impervious coat, by a thickly-clad silk cocoon, or by an earthen cell in the ground, the majority of insects usually pass the winter in this stage. In this stage, the circulation and respiration is much lessened, while the supply of fat stored up by the larvæ is sufficient for the needs of the pupa.

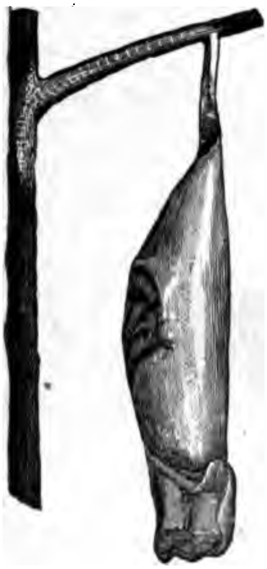

Fig. 37. Attacus promethea cocoon.

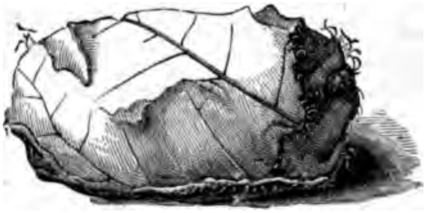

Fig. 38. Telea polyphemus cocoon.

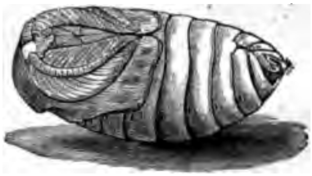

Fig. 39. Telea polyphemus chrysalis from interior of cocoon.

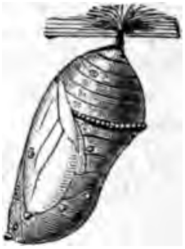

Fig. 41. Chrysalis of Milkweed Butterfly (Archippus).

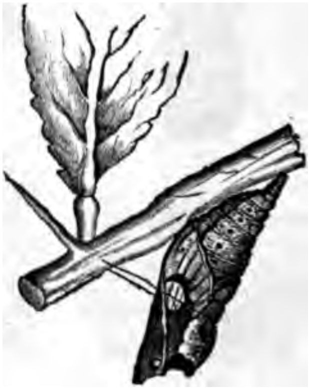

Fig. 42. Chrysalis of Papilio Cresphontes, showing mode of suspension.

It is interesting to study the pupal forms of insects, with reference to their adaptations to their surroundings. When pupæ are incased within cocoons (Figs. 37, 38, 39) or earthen cells (Fig. 36) they are smooth and rounded, but when chrysalids are formed, such as is the case with butterflies, and when there is considerable exposure to wind and weather, they are rough and angular (Fig. 40 *b*). The chrysalids of the Nymphalidæ, to which the Milk-Weed Butterfly belongs (Fig. 41), are all suspended by means of a button of silk to the under surface of some object, and they swing freely. It is plain that the "horny tubercles and roughened, calloused ridges" of such chrysalids protect the swaying bodies. The chrysalids of the Papilionidæ (Fig. 42), to which our Swallow-tails and Cabbage-butterfly belong, are held in place both by a button of silk and by a girdle of the same material, which passes around the middle of the chrysalis.

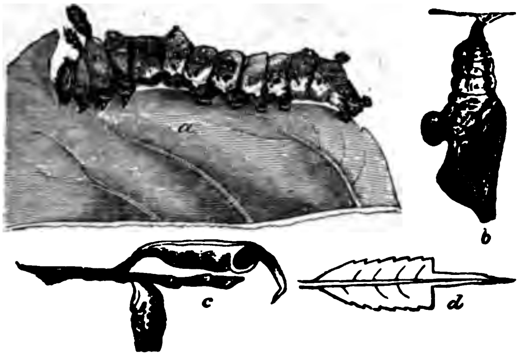

Fig. 40. *a*, Larva; *b*, chrysalis of Limenitis disippus butterfly, showing angulations and mode of suspension.

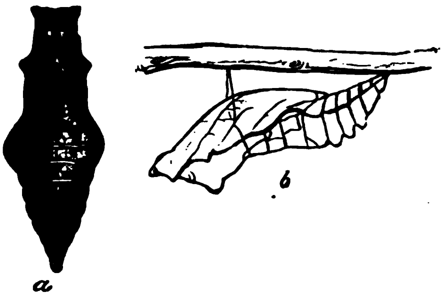

Fig. 43. Chrysalis of Papilio philenor. *a*, Back view, showing angulations; *b*, side view, showing mode of suspension.

Among the common insects which hibernate as pupæ are :

The Sphinges (*Sphingidæ*).
Cabbage-butterflies (*Pieris rapæ*).
Cecropia (*Samia cecropia*).
Polyphemus (*Telea polyphemus*).
Corn-Worm (*Heliothis armiger*).
Army-Worm (*Leucania unipuncta*).
Datana Ministra.
Spring Canker-Worm (*Palæacrita vernata*).
Pea and Bean Weevils (*Bruchus pisi*, *B. obtectus*)
Squash-Borers (*Melittia ceto*).
Potato Beetle (*Doryphora decemlineata*).
Saw-flies (*Tenthredinidæ*).
Phorbia.
Oberea bimaculata.
Pear Midge (*Diplosis pyrirora*).
Clover-seed Midge (*Cecidomyia leguminicola*).

The Adults. Many insects in their adult condition are strongly chitinized and otherwise protected against wind, cold and rain. Such forms are well able to hibernate, more especially in the dormant condition. Among common forms are :

Grape-vine Flea-beetle (*Haltica chalybea*)
Plum Curculio (*Conotrachelus nenuphar*)
Potato-stalk Borer (*Trichobaris 3—notata*)

Asparagus Beetles (*Crioceris asparagi and C. 12—punctata*), Figs. 16, 19.
Potato Beetles
Cucumber Beetles (*Diabrotica vittata, D. 12—punctata*), Figs. 44, 45.
Buffalo Carpet Beetles (*Anthrenus scrophulariae*)
Bark Beetles (*Scolytidae*)
Squash-bugs (*Anasa tristis*)
Lace-Bugs (*Tingitidae*)
Chinch-bugs (*Lygæidæ*)
Stink-bugs (*Pentatomidae*)
Pear-tree Psylla (*Psylla pyricola*)
Leaf-Hoppers (*Jassidae*)
Green-fruit Worm (*Xylina*)
Mourning Cloak Butterfly (*Vanessa antiopa*)
Army Worm (*Leucania unipuncta*)

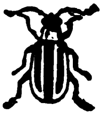
Fig. 44. Diabrotica Vittata.

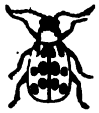
Fig. 45. Diabrotica 12—Punctata.

The more the question of hibernation forms is studied, the more difficult it seems to account for the great number of variations; at the same time it becomes apparent that the particular form assumed during winter can only be determined by a study of the phylogeny of the insect. All Zoologists are not agreed as to the probable habitat of the primitive insects, but the bulk of the evidence points to them as land-dwellers and not water-dwellers. That the primitive adult insects were wingless and like the larvae is also conceded. They were ametabolic, that is, undergoing no metamorphosis. Our Thysanurans are supposed by some Zoologists to reveal many of the characters of the primitive insects. They live in damp places, under stones and rubbish, and are protected by these objects during winter, and there is no need for any special hibernation form. We can readily imagine, however, that as the numbers of the primitive insects increased, a "struggle for existence" would arise, and natural selection would choose out those forms that by accident, or otherwise, adapted themselves to changed conditions, either on land, in the air, or in the water. Tracheal gills of aquatic larvae may be regarded as an adaptation to an aquatic condition, and wings as an adaptation to an aerial existence. When insects possessed wings, environmental changes would be great and there would arise the necessity for a "Division of Labor" on account of the difficulty in securing food during the winter season. The larval stage was devoted to the acquiring of food, and to growth, and the adult to reproduction. Then came the pupal stage, as an act of necessity, to bridge over the gap between larva and adult, when preparations could be made for the complete formation of the adult. According to this, the pupa would be the normal hibernation form for most insects in our latitude.

ANOSIA ARCHIPPUS DOES NOT HIBERNATE.

By J. Alston Moffat, London, Ont.

The method of explaining the unobserved portions of the life history of *Anosia Archippus* by analogy, or bringing them into conformity with what was known in the life history of other butterflies, has retarded rather than assisted in removing the difficulties connected with it. There are several peculiarities in the life history of that butterfly which have been often enough observed to place them amongst the established laws of its nature, that are so different from anything known in the life of other butterflies, that it becomes necessary to seek an explanation of the unobserved portions of its history, in accordance with what is known in its own life rather than in the life history of other butterflies.

For instance, it does not pass the winter in the mature state in this locality. Nor can it survive it in any of the stages of its existence in its northern breeding grounds; hence after each succeeding winter these regions where it is produced in the greatest abundance have to be replenished in the spring by individuals coming from the south. (Using these geographical terms in an undefined manner). Its noticeable habit of congregating in immense swarms in the north at the end of summer, combined with their utter disregard for each other sexually, whilst closely associated with each other individually for so long a time, is without a parallel in any other known species and therefore has a special significance of its own. Then the fact that these swarms move off together on the approach of winter, as if by mutual understanding, in a southerly direction, combined with the fact that similar swarms have been observed on more than one occasion wintering in the south, where such multitudes could not have been bred on account of the scarcity of their food plant there, clearly indicates that they had come from the north where they are bred in such profusion. When I wrote my paper for the 31st annual Report of the Entomological Society of Ontario, 1900, although quite convinced that *Anosia Archippus* was not a hibernating butterfly, yet I could not produce the evidence necessary to sustain and justify my belief, so I sent a copy of that report to Dr. Thaxter with a note calling his attention to it, that he might have an opportunity of correcting any erroneous conclusions I had arrived at, if he thought necessary. In return I received a most genial acknowledgement from the doctor, from which I have the pleasure of copying the following statement which is connected with the subject in hand :

"About those Archippus butterflies I have a memorandum on the sketch which I made at Appalachicola [which was published in the *Canadian Entomologist*, vol. xii. (1880) page 38], Fig. 46 to the effect that it was drawn from nature January 3rd, 1873. If I remember rightly the butterflies did not begin to scatter till February and then many were seen in coitu."

That appears to be conclusive and makes it certain that those flocks of *Archippus* butterflies seen by Dr. Thaxter in Florida (Fig. 46), were not there in search of a place to hibernate, but with the intention of passing the time in an active state until their season for breeding had arrived. The chain of evidence now seems to be complete, although every link in that chain has not yet been forged ; that those immense swarms that come together in the north where they were produced in such profusion, take their departure in flocks from the north for the very purpose of going south to winter there. Not always in a direct line but always tending in that direction, their movements are influenced by the nature of the route and the character of the weather. Not rushing impetuously onward to their destination as some butterflies are reported as doing, "Entomologist's Record," vol. xiii., page 98, but as becoming their regal character, deliberate and dignified in all their movements ; enjoying their journey and the novelties of the way ; having none of the distractions of family affairs to disturb their equanimity, being quite conscious that the serious business of their life is well off in the future and that in good time they will reach a suitable locality where they may spend the winter in comfort and safety.

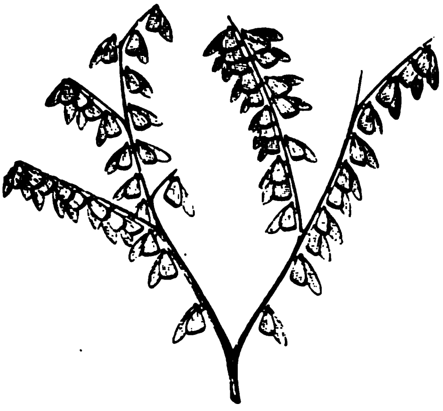

Fig. 46.

Having thus obtained a satisfactory explanation of their autumnal gatherings in the north, as part of their constitutional habit of wintering in the south, one may regard that portion of *Archippus* life history as conclusively settled, and turn our attention to its spring movements, and enquire, when and from whence do the northerly migrations originate? In the absence of observed data we will have to be guided in the formation of our opinions on the subject, by the well known habits of the butterfly, and the climatic conditions of the localities it frequents.

Those swarms of *Archippus* that were seen wintering in Florida, probably reached that locality from somewhere in the north, about the end of November. They broke up in February and dispersed. Then, as is naturally to be expected, the sexual desires which had for so long lain dormant were aroused, and they prepared to carry out the purpose of their existence, namely, the multiplication of their kind. With that end in view they must first find *Asclepias* the food-plant of their progeny ; reported to be always scarce in Florida, and in February probably no fresh plants of it to be seen there. Where then are they to obtain it? Certainly not by going northward at that time of the year, but by going still further south.

Prof. Riley as early as 1878 made observations upon southerly spring movements, but being confused with the hibernating theory he failed to realize their full significance. From an article in the "Scientific American" for April 6, 1878, a part of which he produced in the "American Entomologist," Volume III., Page 102, I copy the following that bears on the subject. After giving his view of their manner of spreading northward in the summer, and their flocking to the south in autumn, he says:

"We can thus understand how there are two, three or more broods in southerly regions, but only one toward British America. The exceptional flights noticed in the spring, and which, so far as recorded, take place quite early and in the same southerly direction, find a similar explanation. They may be looked upon as continuations of the autumn flights. Hibernating in the temperate belt, the butterflies are awakened and aroused upon the advent of spring, to find the milk-weeds not yet started, and they instinctively pass to more southern regions, where spring is more advanced."

Eliminating from that statement the hibernating idea, it is otherwise quite in accordance with what we know of the habits of the butterfly. Whilst the region of which Dr. Riley was speaking being Texas, Indian Territory and Kansas, where the autumn flocks would be gathered from a different part of the continent than those came from which were seen in Florida, their movements would be influenced by the character of that region, yet their natural disposition would remain the same, which is to move on and extend the species where ever it can find suitable conditions. Now the whole literature of the species testifies to its being a wanderer. Yet we know by its conduct in the north that it does not wander aimlesly. It seems to have a purpose and "a method in its madness" in that respect which looks wonderfully intelligent.

That habit being constitutional to the species, it will be found in some measure to influence every individual of it and control its movements to the utmost limits of its southern habitat on this continent, therefore, we are not warranted in restricting its northerly migratory movements in the spring to those individuals found in the more northern portions of its southern home. For those northern bred specimens that wintered there, when they have been aroused to activity by the approach of their breeding season, will move southward for we know not how far, depositing eggs as they go before they are exhausted, whilst at the same time, those born in extreme limits of its southern breeding grounds, impelled by that intense desire to travel and spread its kind will be moving northward. Thus migrations in opposite directions will be going on together ; and it may yet be discovered, that the majestic sweep of that annual movement is far more extensive, regular and continuous than has ever been suspected.

On such considerations as these, in the absence of actual observations, we have to depend in forming our conclusions as to when, and from whence, the first arrivals in the north have their origin. Those that reach West Virginia about the end of March, would appear necessarily to come from somewhere much further south than Florida ; whilst those that reach Ontario about the end of May, might be born there or thereabout. But so much depends upon the character of the seasons, and the directness or otherwise of the flight of the butterflies, that all positive conclusions must be withheld. The climate of Florida is not always favorable as a winter residence for the butterfly. Cold waves from the north descend upon it at times, so as to destroy the orange groves, and a few years ago a frost in the South nearly exterminated the blue birds, and for years after scarcely one was to be seen in Ontario, and only now are they becoming common, and it may be years yet before they are as plentiful as formerly.

Now, *Archippus* is not likely to survive a frost that killed blue birds ; yet no one in the north observed an unusual absence of Archippus in the following season, as was the case with the blue birds ; and yet the probability is, that a wide belt along the South Atlantic States was swept clear of this particular butterfly during that winter. So we see that such a widely extended migratory movement is necessary to maintain the regular northern supply for propagating purposes in that region.

In regard to the number of broods in a season produced by the species in its tropical home, we are as yet without information. But, from what we know of its nature and habits, it seems as if it would require several to enable it to complete its annual functions. That it has no well defined broods in the north is certain, and the long continued straggling nature of its oviposition supplies us with the reason for it. (Scudder's "Butterflies of Eastern U. S. and Canada," Vol. I. page 742). And as it will follow the same course in the South, it will make it very difficult to determine the number of its broods there. That Mr. Edwards has seen them pairing in W. Va. is indicated by his remarks when dealing with the subject ("Psyche," Vol. II., page 169), which may be regarded as illustrating its habits in that locality, but that there would be as many broods in nature as he obtained in confinement does not seem probable ; or that the butterflies bred there in nature would remain there to breed again is not at all likely, as it is not in accordance with its nature and habits to do so. I saw *Archippus* pairing on one occasion at Hamilton, in numbers, about the middle of June (Can. Ent., Vol. XX., p. 137), But singularly enough, it was the only instance of the kind that I ever witnessed ; and that single instance cannot be regarded as exhibiting the regular habit of the species in that locality, but rather as an unusual and exceptional occurrence, for which there would be some special reason if we only could trace it. I do not now consider that those pairing individuals that I saw would be the first arrivals of the season for that year, but rather that they belonged to a brood produced in some less distant locality, but yet had travelled far before they were ready to mate, and would proceed yet further north in conformity with the established habits of the species.

The desire to travel, which is so strongly developed in *Anosia Archippus*, and which is so strikingly disclosed in its regular migrations on this continent, which constrains it as it were to turn its head northward in the spring, and southward in the autumn, and holds it as rigidly to these points of the compass until it reaches the furthest limits of favorable breeding conditions, is a faculty of direction which we do not yet comprehend. The migrations of birds w l not assist us to unravel the mystery, as the old birds are supposed to guide the young ones on their first trip. The finding of their homes at long distances by cats, dogs and carrier pigeons does not apply, as in these instances it is with them a return journey ; none of our butterflies were ever over that road before. Sight avails them not. Scent, as we know it, cannot assist them ; and yet there may be an influence in the air affecting them that suggests both the time to start and the direction in which to go. We know that in some of the lower animals a particular sense can be found that is far more highly developed than the same one is in man. And we also know as a fact, although we cannot explain its operation, that there is in some of the lowest forms of life, where there is no nervous organization to receive an impression, a phenomenon termed "Heliotropism," signifying a turning towards the sun, which is as constant and certain in its operation as any other law of nature. Now, may there not be in these butterflies a sense perception of direction, of which we know nothing, but of whose presence they are perfectly conscious, and to whose promptings from without, they respond as readily as to their food, and which guides them as unerringly as in the choice of a food plant for their progeny? An influence in the atmosphere or from the sun, a kind of Heliotropism ; or one that seems to combine all others, and one which is getting to be more and more acknowledged as pervading and influencing everything, whilst uniting objects the most distant, and, as it were, obliterating space, but which has not yet, in this direction, found a place in the domain of science, namely,—electricity and magnetism? An influence which so acts upon their sensibilities as to prompt them to move in unison, at the proper time and in the right direction,—confidently, but unconcernedly as to cause or consequences?

COLLECTING AT LIGHT IN 1901.

By J. D. Evans, Trenton.

Early in June last the writer commenced collecting at an incandescent electric light which was continued every night with very few exceptions until about the middle of September; the light was outside and in front of the front porch; immediately below the light was fixed a funnel made of heavy white paper, and below and contiguous thereto was placed a deep glass jar containing cyanide of potassium. This would be placed in position at dusk and left out (except when rain threatened) all night.

On a favourable night myriads of insect life would be taken, caddis flies predominating, but always accompanied by a goodly percentage of moths, beetles flies, and bugs, with a few Hymenoptera. Upon the most unpromising nights 25 or 30 moths would be taken, which would increase to 100 or 150, or more, on a favourable night. The subdued light shed by the white paper seemed to have a peculiar attraction for the insects, for very few entered the house although windows were open and rooms well lighted.

Of the moths some species were taken in large numbers, particularly micros. Among the varieties may be mentioned *Plusia contexta*, and *P. striatella*; also *Xanthia togata* and a number of species not yet determined.

Among the Coleoptera many families were represented, and many species rarely met with were taken in large numbers, a list of which will be prepared at an early date. Among the families most numerously represented may be mentioned Carabidæ, about 40 or 50 species, Hydrophilidæ, Nitidulidæ, Elateridæ, Scarabæidæ, Cerambycidæ, Chrysomelidæ, and Anthicidæ.

The Hemiptera were represented chiefly by fully 20 species of leaf-hoppers.

Very few insects were taken during the season other than by light.

I can record the capture of a fine specimen of *Papilio cresphontes* in the garden on the 20th August; it was hovering over a patch of Phlox Drummondii.

THE MILKWEED AT DUSK.

By Albert F. Winn, Montreal.

The attractiveness to insects of the flowers of the milkweed (*Asclepias cornuti*) has given rise to a new popular name of "Butterfly Weed" being applied to it. This name certainly appears appropriate enough to any one passing a patch of the plant in full bloom on a hot July day, with the blooms and the air around just alive with gay butterflies. But the entomologist wants something better than *Danais archippus*, the various species of *Argynnis*, *Limenitis disippus*, and *Pamphilas*, when he has a day to spend in the fields, and if he spends much time around the milkweed he will probably come home with a great quantity of specimens of a dozen species of the commonest of our butterflies, which he will carefully put away in papers to remain there till doomsday.

I have often wished to have the opportunity of watching the milkweed blossoms regularly in the evenings, but till this summer have not had the chance. In July of this year I spent my fortnight's vacation at Fortune's Rocks, near Biddeford, Maine, and the day after my arrival I came across a fine patch of milkweed in the centre of a hayfield, the plants flourishing there owing to the ground in this spot being higher than the rest and rocky, so the mowing machines failed to do their deadly work. The usual array of butterflies were eager to quench their thirst, and an occasional bee moth, *Hemaris thysbe*, darted about from flower to flower. Being close to the house where I was staying I felt that now was the chance to see whether the plants were not something else than "butterfly weeds," and on the evening of July 8th I sallied forth at about 7.15, armed with a net and two cyanide bottles. The first insect I saw was a big dragon fly busily engaged among the mosquitoes, which were exceedingly voracious. Nothing was on the blossoms but a few belated ichneumons and bees when I first arrived, but about 7.20 the *Heliophila pallens* and *adonea* appeared in perfect swarms, crawling all over the blooms. At 7.30 it began to be more like twilight and something dashed through the field and hovered near me over the plants. My first shot missed it, but it soon returned to another flower head and was captured—a *Sphinx gordius* (fig. 48). A moment later I had another of the same kind. Then a smaller dark fellow appeared, evidently a hawk moth, but new to me—*Dolba hylaeus* (fig. 47.) With this and the first *gordius* in one bottle, and the second *gordius* alive in the other, I was beginning to wonder what I should do if another Sphinx came along. It soon came in the shape of *S. kalmiae* (fig. 49), so I put the three previous captures in one bottle and he *kalmiae* in the other, when another *kalmiae* hovered right in front of me, but before I struck at it I noticed a few steps further on another *Dolba hylaeus*, and thinking this too great a prize to miss on account of a *kalmiae*, I made a stroke through the plant and to my surprise found I had not only the *Dolba* but two *S. gordius* as well. Didn't the scales fly from their wings? By this time the patch was simply alive with Sphingidae, and having filled both bottles I returned to the house, but found most of the specimens had suffered through being put into too small a space while alive. I should have known better, but one who has been accustomed to catching perhaps a dozen Sphingidae in a season is not likely to abstain from catching as many as possible when occasion arises, therefore any one knowing of an isolated patch of milkweed in full bloom during the flying season of the Sphingidae should go prepared.

The following evening seemed even more favorable, and I took my whole stock of bottles, four in number, a tin box charged with cyanide, and a box with cotton wool in it,—and Mrs. Winn accompanied me with another net. As on the previous night it was about 7 30 before any Sphingidae showed up, about half a dozen *Dolba hylaeus* arriving simultaneously, then *Sphinx gordius*, these two being always first—perhaps because there were more of them. A *S. Kalmiae* then flew over the patch without settling down, and with a sudden raising of the wings of one side darted across the field again, only to return in a few seconds. The eye could easily follow this species in the partial light owing to the light brown color, and they were noticeably shy till it became almost dark, perhaps instinct taught them that their colors were not a protection while hovering over flowers and dark leaves, though what enemies they have other than human beings I do not know. We used the bottles one after the other, and when No. 4 was occupied the Sphinx in No. 1 was transferred to the cyanide box in case there might be any life left in him ; then No. 2 into the box, and so on. Even then we could not kill them half quickly enough—and every minute some new kinds seemed to be appearing. *Philampelus achemon*, *Sphinx drupiferarum*, *Deilephila lineata*, *Darapsa chœrilus* and *myron* were plentiful, and a single *Sphnix luscitiosa*. There were so many specimens on the same head of flowers that it was difficult to pick out a particular one from among the humming throng. We soon found that making a stroke upwards was the only way to catch one at a time, a stroke through the blooms or downward over it meant at least a dozen—and pandemonium.

We soon got acquainted with the habits and appearance of the different species—the little *Dolba hylaeus* being easily noticed by its small size and dark color and keeping mostly to the edges of the patch—*gordius* looking nearly black and twice the size of *hylaeus*—*drupiferarum* in turn seemed blacker still, the pale costa making it conspicuous—*S. kalmiae* was quite unmistakeable in its flight from flower to flower on account of its color—*Darapsa myron* and *choerilus* were easily picked out by their small size and different flight, and they even settled on the blossoms—the large bodied *Philampelus achemon* and *pandorus* were also as easily recognized in the semi-darkness as in a glass covered cabinet drawer.

Our second evening resulted in our bringing home over forty specimens, belonging to ten species of hawk moths.

I shall not take up more time with details of further evenings spent at the same spot, but every visit was time well spent. Many interesting specimens among the smaller moths were captured. *Plusias, Hadenas, Heliophilas and Mamestra* being in myriads some nights. On the last evening of my stay, July 20th, I caught only seven Sphingidae, but do not think their season was over for I took these within a few minutes of my arrival, and a cold thick fog came up over the fields just before I left them and it is not unlikely that the insects felt it before I did.

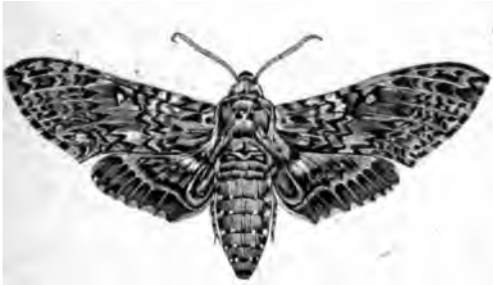
Fig 47.—Dolba hylæs.

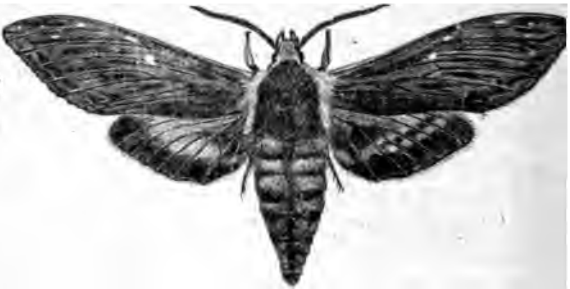
Fig. 48.—Sphinx gordius

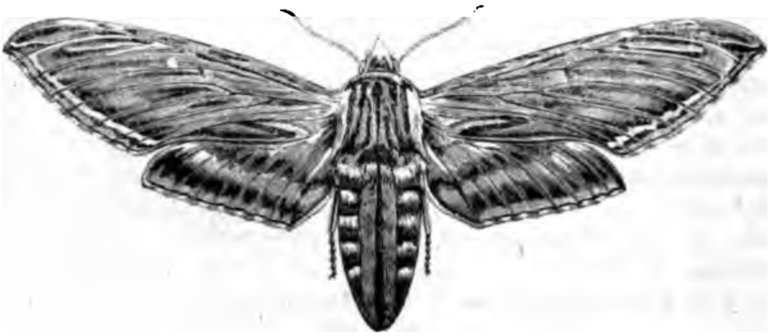
Fig. 49.—Sphinx kalmiæ.

For anyone fond of nature, it would not be easy to select a spot more interesting to spend an hour in, than that occupied by my milkweed patch—on its slight elevation, in the midst of hayfields, the sunset gradually fading away over the Maine Woods and the day-flying fauna disappearing to their resting places, to be replaced by a nocturnal fauna as invisible by day as the former is at night. The scent from the milkweed plant grows stronger as darkness sets in, the moths begin to flutter about, the whip-poor-will is heard on every side and the roar of the sea on the shore seems more soothing than by day.

We cannot all have the accompaniment of the ocean, but any entomologist who has not examined the milkweed blooms at dusk has a pleasure still to look forward to.

A COLLECTING TRIP IN SOUTH-WESTERN ONTARIO.

BY E. M. WALKER, TORONTO.

During August, 1901, the writer had the good fortune to accompany Prof. John Macoun, Naturalist to the Geological Survey of Canada, on a collecting trip in the South-Western peninsula of Ontario.

Prof. Macoun's investigations occupied the whole summer, from the latter part of May until the beginning of September, and collections of plants were made at a great many localities, covering practically the whole district.

The chief object which I had in view in making the trip was the collection of Orthoptera, as the region traversed was quite unexplored from this point of view. The time which I had at my disposal, however, was limited to the month of August, so that I was unable to visit localities enough to represent the entire district.

While most of my attention was given to the Orthoptera, I also collected a considerable number of Odonata and kept on the lookout for anything of special interest in the entomological or botanical line.

Our first stop was made at Leamington, a place not specially interesting in itself, but one from which several very profitable trips can be made. The chief of these is the trip to Point Pelee, the extreme end of which is some twelve miles distant from the town. It is a long sandy point, very narrow in its lower part, where it is largely covered with red cedar and juniper, but is somewhat wider in its upper part with sand dunes of some size on the west side, beyond which on the east are broad prairie-like flats of excellent wheat lands, formerly marshy. There are still marshes which will repay the collector in probably any branch of Insecta. The upper part of the point is beautifully wooded with magnificent walnuts, nettle-trees (*Celtis occidentalis*), basswood, cottonwood, etc., and a variety of oaks, with junipers in the more open places and near the beach ; and many southern plants and insects are found there. I spent a day on the Point, and saw a *Papilio Ajax*, several of *P. Cresphontes*, any number of *P. Troilus* and captured a beautiful specimen of *Limenitis Ursula.*

Along the roads leading from Leamington to the Point *Papilio troilus* and *asterias*, especially the former were present in astonishing numbers. The presence of the former is what one would expect from the large number of Sassafras trees in the locality.

The bordered skipper (*Ancyloxypha numitor)* was present in great numbers along every roadside ditch and many specimens of another southern skipper (*Pholisora Catullus)* were also seen. The tobacco-worm, *Phlegethontius Carolina* is common in this district on the leaves of the tobacco which is grown in large quantities and of good quality in this part of the province.

The Orthoptera were very interesting, the family *Locustidae* or green grasshoppers and katydids being abundantly represented in the large open marshes at the north end of the Point. In fact I found them to be very well represented everywhere throughout Southern Ontario, the group being on the whole a decidedly austral one. This fact will be appreciated when the number of species inhabiting Southern Ontario is compared with those of the Nipissing and Muskoka districts. I took about 21 species in southern Ontario, whereas in Muskoka there are but eight and in Nipissing probably not more than five, only one of which is truly characteristic of the north. Most of the 21 southern species are Ohio and Indiana forms, such as *Xiphidium Scudderi* and *nigropleurum*, *Orchelimum indianense*, *O. longipenne*, *Conocephalus nebrascensis*, etc.

One marsh, especially at Point Pelee, yielded a remarkable variety of forms within a comparatively small area. This was at the mouth of a small creek which emptied into the lake at the upper end of the Point. On either side of the creek was a growth of wild rice, so tall and vigorous that at a short distance it had much the appearance of a field of Indian corn, and beyond this, where the ground was not quite so wet, was an extensive growth of rushes and sedge. It was in the sedge that the green grasshoppers were most abundant, but they were very difficult to capture since, when alarmed, most species of Locustidae, especially the smaller kinds, have the annoying habit of darting downwards into the sedge and then leaping rapidly from one stem to another until one has not the least idea where to look for them. Fortunately, however, most species are found in large numbers when their particular haunts are discovered.

In this marsh, and practically in one spot, I took no less than a dozen kinds of Locustidae alone, all but two of which are unrecorded from Canada. Of these, one of the most striking in appearance though the smallest in size, is *Xiphidium Scudderi*, a long-legged little hopper, brownish instead of the usual green color, with short wings, long antennae and an extraordinarily long straight oripositor, often twice as long as the body. *X. attenuatum*, of which I found a few specimens, seems to be merely a long-winged form of the same species. Another interesting addition to our fauna made at Point Pelee is *Scudderia Texensis*, a very large bright green form related to the well-known *S. curvicauda* but larger. It is one of the katydid tribe and has a wing expanse of fully three and three-quarters inches.

The most abundantly represented genus, however, was *Orchelimum*, six species being found. Now this is remarkable when it is remembered that from Toronto northward to Lake Superior only one species occurs and that a very common and widespread one, viz., *O. agile*. This, by the way, is the common meadow grasshopper, whose familiar song, the "jip, jip, jip, zee-e-e," is known to everyone.

The other families of Orthoptera did not yield so many new forms, but one of them taken in the same marsh as the one just described was wholly unexpected and has a very southern distribution. This is *Tryxalis brevicornis*, a slender green and brown Acridian, with a long conical head and short flattened antennae. Its distribution as hitherto known is from Indiana and Long Id. to Honduras and Brazil, its occurrence in Indiana having been considered as unusually far north. I got but two specimens, both males, in good condition.

Another trip which we took from Leamington was to Arner, a village a few miles west of Kingsville. There were large open marshes here also, but although apparently very similar to those of Point Pelee, both the flora and insect fauna were in many respects different, some species common at Arner being entirely absent from the Point and vice versa. For example, not a single specimen of *Paroxya floridana* was seen at Point Pelee though very common at Arner, and *Orchelimum Bruneri* was very common at Point Pelee, but none were seen at Arner. This was in fact the only locality visited during the present trip where the first named species was found. It is a pretty brightly colored grasshopper with blue hind tibiae and is characteristic of the Eastern States from southern New England and Indiana to Florida, not having been taken in Canada before.

Another very interesting form taken at Arner which must not be overlooked is *Atlanticus pachymerus*, belonging to the Decticinae, a group of Locustidae, characteristic of the western half of North America, Atlanticus being the only eastern genus. It is a large, clumsy, brown, cricket-like form, the female quite devoid of either tegmina or wings, though the male has retained the tegmina as organs of stridulation. The thorax is very large and shield-like, and this feature has given the insect the name of the shield-back grasshopper. It is found in ravines and wooded hill-sides, but I came across it only at Arner.

From Leamington we went to Sarnia but on the way we stopped for five hours at Chatham and went for a tramp along the Thames embankment. Here the flora was quite unique in character and of great luxuriance and vigor, the nettles and Jerusalem artichokes towering far above our heads. The Professor pointed out several prairie species there, not found elsewhere in the Province, and it is his belief that this section was once prairie. It certainly would appear so to judge by the presence of these typically prairie plants and the general perfectly level appearance of the country.

At Sarnia there is a great deal to interest the entomologist and Prof. Macoun found a great number of plants not recorded from Canada, among which was a grass new to science. The most striking thing in the insect line was the abundance of *Papilio Cresphontes*. Any number could have been taken but I had no space in either my bottles or boxes for anything but Orthoptera and dragon-flies. Another interesting butterfly found here and both at Chatham and Leamington was *Pieris protodice*. At the two latter places it is the common white butterfly, *rapae* being only occasionally seen. At Sarnia both are common but *protodice* is much the more predominant, while further north only *rapae* is seen.

This re-appearance of *P. protodice* after its apparent replacement by *P. rapae* strikes one as being quite remarkable, and it seems to confirm Mr. Moffat's opinion, expressed in the Twenty-fifth Annual Report of the Entomological Society, p. 61. He refers to the rapidity with which this change was brought about and regards as very improbable the theory that the disappearance of *P. protodice* has resulted as a consequence of the struggle for existence and the survival of the fittest. Mr. Moffat's idea is, briefly, that the two forms are races of one species, which on being brought together have interbred ; the result being the persistence of the characteristics of the stronger race, *rapae*, and the suppression of those of the weaker, *protodice*. But although *protodice* is weaker, its characters are such as have resulted from its particular environment, such as the climatic conditions and other external influences under which it lives ; and hence these characters must inevitably reappear in time as these same forces are still at work. Mr. Moffat also noted the recent capture of a few specimens of *protodice* in the vicinity of London and expressed the opinion that it would be common again in time. That it is becoming so seems to be evident from what I have observed in Southern Ontario, whatever the explanation may be.

Of Orthoptera and Odonata a number of interesting things were taken. Most of these were captured in a large open stretch of meadow-land, which extends along the St. Clair River between the town and the southernmost point of Lake Huron, where the St. Clair River leaves it. This stretch of country is under water during the spring and early summer but was quite dry when I saw it in August, and portions of it were gorgeous with the purple spikes of *Liatris spicata*, the dense button-snakeroot, making one of the most brilliant floral displays I have ever seen. Several interesting things were found here, notably *Orphulella pelidna* and *Conocephalus nebrascensis* neither of which had been taken before in Canada, nor were they met with again during our trip. I also took specimens of the two beautiful dragonflies, *Celithemis eponina* and *C. elisa*, the former flying about for the most part near the river where the ground was still wet, the latter being commoner further inland.

Separating this stretch of meadow-land from the wide beach of the lake is a high ridge of sand dunes wooded mainly with oak, while west of the town of Sarnia is the cemetery, which is also sandy, being much like High Park in character. Both of these localities, especially the latter, will richly repay the efforts of the entomologist.

Before leaving Sarnia finally the Professor and I crossed the river to Port Huron and thence took the electric railway down the river to Algonac, where we hired an Indian boy to ferry us across to Walpole Id. This is a Canadian island of considerable size and has been set apart as an Indian Reserve. It is an excellent collecting-ground being for the most part occupied by woods or marshes. Here I saw a great many *Papilio Cresphontes*, *Limenitis disippus*, *Pieris protodice* and other butterflies sipping the moisture from the ground near the water's edge. The marshes yielded numbers of *Orchelimum longipenne*, a green grasshopper only one specimen of which was seen elsewhere, namely at Point Pelee. I was indeed much struck throughout the trip by the fact that these open marshes, though often apparently of the same character and not far distant from one another, may support faunas which are by no means identical, some species found not at all or very sparingly in one marsh being common in another and vice versa. I was unable to discover the reason of this but I imagine that on closer examination the conditions would prove to be more different than was apparent at first sight, or that many of the insects found therein are very local.

From Sarnia we went by steamboat to Goderich, which town we did not find very interesting from a natural history standpoint, the country being entirely of a clayey character; so we contented ourselves with a single day's trip which was very unprofitable entomologically, the only thing of special interest which was taken being a specimen of *Cychrus Lecontei*, a rather rare carabid beetle.

Our next stopping place was Southamptom, a locality which amply repaid both of us and one where a great variety of country is to be found close at hand. The shore, which at Goderich is a steep clay bank about 200 feet high, is again low and sandy,* a magnificent beach which strongly recalled the sea shore extending for some miles on either side of the town.

The forest growth here is quite boreal in character; white spruce, white cedar and juniper (*Juniperus communis* and *J. sabina* var *procumbens*) being the prevailing trees on the sand dunes which form a ridge behind the beach. Back of this ridge a short distance south of the town is an extensive swamp, in which the orthopterous fauna was also of northern type.

The most interesting capture made here however was an Oedipodine, a new species of *Trimerotropis*, which was found flying about on the beach, having essentially the same habits as *T. maritima*, which is abundant on the beaches of the great lakes further south, extending a little above Sarnia and is also found on the North Atlantic seaboard. As soon as I observed this extensive beach at Southampton I thought of the probability that either *T. maritima* would be found there, and if so at a much more northern locality than hitherto reported, or that some other species would take its place. After considerabie search the latter proved to be the case and the species which replaced *maritima*, though closely allied, differs from that species not only in structure and markings but also markedly in the character of the stridulation.

I did not find much else of particular interest at Southampton, but this was doubtless because I paid small attention to anything but Orthoptera and Odonata; but on general principles I should highly recommend the locality to entomologists who are studying the Ontario species of any group of insects, because I believe there are very few, if any, places of exactly the same character in the Province. I doubt if a wide and extensive beach is to be found anywhere north of Southampton, as the eastern shore of Lake Huron north of a point about ten miles above Southampton is, as far as I know, continuously rocky.

After spending a few days collecting at Southampton we hired a good sized fishing boat and spent a most delightful week on the lake between Southampton and a small town called Tobermory, a few miles from Cape Hurd on the Georgian Bay side. Our party included the Professor's assistant and two fishermen, besides ourselves, and the object we had in view was the examination of the east shore of the lake as far as the Cape and also a few of the islands.

We cooked our meals and slept on board, though at night we of course always put into some harbour, of which many fine examples are to be seen. At Tobermory, for instance, there is a beautiful harbour, about half a mile long, the shore of which at the town is perfectly vertical to a depth of about thirty feet below the surface and some three or four above, so that no wharf of any kind is necessary and large vessels can come up close to the shore.

A decidedly northern flora and fauna is to be met with in this peninsula, but Prof. Macoun says that half a mile or so inland these conditions give place to the ordinary hardwood forests, such as would be met with in any part of Ontario at that latitude. This northern climate is mainly due to its proximity to the cold lake, but another factor also contributes in some parts of the shore rendering the climatic conditions boreal in character. This occurs at certain points ere the limestone is very low and flat and only just a little above the level of the lake. The snow and ice in these places remain in the woods sometimes as late as June and in early summer the place is still very wet. Later on, however, it dries up and the rock is exposed or is very near the surface almost everywhere.

The soil on this peninsula is very scanty and on the low places near the shore the plants and insects are very few in number of species. The Professor said that the flora resembled that of Anticosti, but I did not notice much that was remarkable about the insects. A peculiar little Catocala was perhaps the most interesting thing taken. It is closely allied to *C. antinympha*, if, indeed, it be not a variety of that species, from which it differs in the much lighter and more distinctly marked fore wings.

Among the Orthoptera *Podisma variegata*, two long-winged males of *Melanoplus fasciatus*, a form of very rare occurrence, *M. islandicus* and *Scudderia pistillata* are perhaps noteworthy. The first named is a very interesting Acridian of the group Melanopli and belongs to an alpine and northern genus, being the only American species which is not alpine. Like many alpine insects it is perfectly apterous and is closely allied to *P. glacialis* of the White Mountains and Northern Ontario. I have also taken it at Lake Simcoe. It inhabits cool swamps, especially peat bogs. *Scudderia pistillata*, which was found not uncommonly on the peninsula and at Southampton, is our one characteristically northern Locustid. It was exceedingly abundant on one of the small islands.

Before leaving the subject of this locality there is one fact concerning it which is worthy of remark, and this, though a botanical one, would probably influence the insects too. Many flowers common to this region and southern Ontario (notably Point Pelee and Sarnia) were in bloom or going to seed at a time when the same plants in the south were in bud or only just beginning to bloom. Now, this state of affairs at first seems very extraordinary when we remember that the snow remains so late here and the climate is decidedly colder than in the south. The explanation lies in the fact that the plants are growing over limestone, which absorbs more heat than any other rock, and much more than the ordinary soil.

After our return to Southampton we spent a few more days there and then drove to Owen Sound, where the limestone forms a bold escarpment overlooking the city and offers new conditions to the collector of both plants and insects. Deep crevices extend far into the rock and from above one can look down these, often forty feet. Some rare ferns are found here, but I got but little that was of interest to the entomologist, though I fancy a coleopterist could have taken plenty of interesting things.

Another locality at Owen Sound which the collector should not overlook is the Patterson House Park, the property of Mr. Matthews, the proprietor of the Patterson House, which is one of the chief hotels at Owen Sound. The park is several miles long and follows a ravine, along the bottom of which a small creek runs. The woods are in a primitive condition and some of the trees, notably the cedars, are of enormous size. The chief thing of interest that I found there were specimens of *Calopteryx maculata*, a beautiful dragon-fly which, though very common in June, usually disappears late in July, my specimens having been taken on the last day of August, an unusually late date. The luxuriance and beauty of this ravine would, I am sure, make it an admirable collecting ground.

Owen Sound was the last spot visited by the writer before returning to Toronto, so that the trip was practically taken up in following the shores of Lake Erie and Huron from Point Pelee to Owen Sound

In conclusion I should like to emphasize one point in connection with the collection of specimens on a trip such as the one which has been the subject of this sketch. Most collectors, as far as I have observed, look for those species only which are wanting in their collections or which are rare or otherwise interesting. This is a great mistake. Every species in the group which the collector is studying should be noted down in a book kept for that purpose, and if the collector is not absolutely certain of the identity of the species, specimens should be taken. It is better, if possible, to take specimens of every species from each locality visited, though, of course, this is unnecessary in the case of some very common and easily recognized species. It is only in this way that an accurate idea can be obtained of the distribution of the species in a given locality, and the value of an accurate knowledge of zoological distribution can scarcely be overestimated.

CRICKETS.

By Rev. Thomas W. Fyles, Levis, Quebec.

There are certain things which greatly excite the wonder of the Old Country visitor to Canada:—the piping of the tree-frogs in the Spring; the flash of the fire flies in the Summer; and the sibillations of Orthopterous insects in the Fall. Other sights and sounds may be new to him, but these intrude themselves so persistently upon his attention—there is so much of them in every case—that they never fail to make a deep impression upon his mind. When he walks out in a calm night of August or September, his ears are greeted with such a tweaking of banjos from the black-crickets, that he almost expects these *nigger* performers to start up a plantation song for his amusement. He thinks to himself, (we may suppose) that the solo of the "Cricket on the hearth" of English writers is a very poor performance, compared with this chorus of the Canadian crickets in the field.

The name cricket is one of those imitative, onomatopœic words, such as "wake-up," "pee-wit," "aye-aye," etc.

In my first year in the country-parts of Canada—long, long ago now—I was riding home at midnight from a visit to sick friend. My road was a lonely one, leading through the valleys of the Brome Mountains. I amused myself by putting together the following lines, suggested by the surroundings:—

On either side the road are rugged hills,
  And leafy branches mingle overhead;
  O'er all, heaven's vast unclouded vault is spread,
Which the round moon with silver radiance fills,
The Gryllus chirrups; the Œcanthus shrills—
  Ten-thousand quavering notes around are blent—
  The shaken air itself seems sibilant—
From every bush the constant burden trills.
It is to us as an outlandish tongue—
  We hear it, and pass on, acquiring nought;
  We know not with what meanings it is fraught,
What triumphs, hopes and fears in it are sung.
To Him, who plann'd the Universe, alone
Ascends the import of each several tone.

But things that make so much noise in the world, as the crickets make, are deserving of more than passing attention; and we may well spend a short time in looking into their structure, their habits and their history.

The crickets belong to the Orthoptera—Saltatoria or leaping straight-winged insects.

The first in order of the Quebec species is,—

ŒCANTHUS NIVEUS, DEGEER. (THE TREE CRICKET.)

This is an elegant creature well deserving of notice; it is a little fairy robed in white—a dweller in the blossoms.

The male Œcanthus (Fig. 24, page 48) has transparent wing-covers rounded at the extremity and strongly veined. It is the combined friction and vibration of these veined wings that produces the notes with which it serenades its mistress.

The female (Fig. 25) has narrower wing-covers less strongly marked. Like a modest damsel she holds her peace.

These insects have ample and delicate hind wings, and long filiform antennæ. Their hindmost feet have four joints each—one more than we find in those of other crickets.

The female has a short, stout ovipositor with which it pierces the twigs of fruit trees, raspberry-canes, etc., and deposits her eggs in the wounds (Fig. 26). The young larvæ appear at midsummer, and feed upon aphides and small fruit.

GRYLLOTALPA BOREALIS, BURMEISTER. (THE MOLE CRICKET.)

The prince of our Canadian crickets is the Mole Cricket. It is a rare insect with us; but it is common in some parts of the United States. In places where it abounds it has been found mischievous. It burrows in the gardens, and eats the roots of newly planted vegetables. 1,400 full grown mole crickets were once found on a surface of two-fifths of an acre that had been planted with cabbages.*

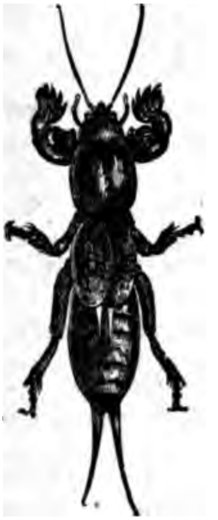

Fig. 50. Mole Cricket.

Its disproportionately large front legs, its abbreviated wing covers, its pleated wings extending to points beyond these, and the long tags with which the body terminates give the mole cricket a strangely grotesque appearance.

The members first mentioned seemingly terminate in gauntleted hands with the fingers extended. But these seeming terminations are neither hands nor feet–they are the tibiæ or shanks of the front legs of the insect. The small feet are attached to the outside of them. With these shanks the cricket delves, and tunnels, and scoops out the chamber destined to be the receptacle of its eggs When not in use these tibiæ are drawn back and protected by the femora.

The length of the mole-cricket is about an inch and a quarter. Its colour is light bay or fawn.†

Much of our information upon the habits of the mole-cricket is derived from the Rev. Gilbert White who wrote more than a hundred and twenty years ago. In his delightful "Natural History of Selborne", he tells us that a gardener mowing beside a canal, struck his scythe too deep, and pared away a sod, exposing a mole cricket's nest and the approaches to it. "The nest was the size of a moderate snuff-box, Within the secret nursery were deposited near a hundred eggs of a dirty yellow colour and enveloped in a tough skin."

In Rennie's "Insect Architecture", enlarged by Rev. J. G. Wood (Bell and Dalby, London, 1869.), p. 266, a cut of the mole-cricket's nest and eggs is given. From this illustration we should infer that the "tough skin" is not a sack enclosing the batch of eggs, but the skin of the eggs individually, for the eggs are represented as lying in an open pile on the floor of the chamber.

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*Dr. Fletcher in 22nd Ann. Rep. Ent. Soc. of Ont., p. 89.

†Harris's Insects injurious to Vegetation, p. 149.

The English mole-cricket is *Gryllotalpa vulgaris* Latr. It is a larger insect than *G. borealis*.

Dr. Lintner in his "Sixth Report on the Insects of the State of New York," says of *G. borealis* ;—"Our-mole cricket lives in the ground, usually in moist earth—often on the sides of ponds or small streams, where it burrows into the moist ground at a depth of from six to eight inches, by means of its front pair of legs which are admirably constructed for digging. Its eggs are laid in these galleries, in a tough sack, to the number of from two to three hundred, within the chamber scooped out for the purpose." Dr. Lintner does not say that he writes this from his own observation ; and we are left somewhat in doubt as to whether the habits of our mole-cricket differ from those of the European, or whether Dr. Lintner's words, "in a tough sack" are a mistaken rendering of White's "enveloped in a tough skin", or again, whether Rennie or Wood drew merely from imagination. It would be well if some Southern entomologist would clear up this matter.

G. borealis is said to hibernate in the larval condition. The perfect insect appears in May or June. The female then lays her eggs which hatch in one month. She guards her young brood until they come to the second moult,for they have many enemies,among which may be reckoned various kinds of ground beetles.

In some parts of England the mole-cricket is called the "Eve-churr", because of its peculiar note ; and Professor Scudder, in an article contributed to the 23rd Report of the Ent. Soc. of Ont., p. 63, compares the call of *G. borealis* to "a guttural sort of sound like grü or green, repeated in a trill indefinitely."

THE FIELD CRICKETS.

But the crickets with which we are most familiar are the commen field-crickets. Of these we have, in the Province of Quebec, at least three easily distinguishable kinds, viz :—

Gryllus neglectus, Scudder.
Gryllus niger, Harris.
Nemobius vittatus, Harris.

The first-named is about two-thirds of an inch long, black, with a brown line along the deflexed border of each wing-cover.

G. niger is a smaller kind. It measures only about half an inch in length. It is jet black. The males are comical little fellows.

Nemobius vittatus is the smallest of the three. It measures only about four-tenths of an inch in length. It is of a dusky brown colour and has three black lines over the head, and a black line along each wing-cover.

Insects of these three kinds are found in great numbers around Quebec. Their notes are produced by stridulation. The wing-covers are slightly raised and the projecting veins of one are briskly grated upon those of the other. The males only produce the sound.

The females lay their eggs in the ground by means of their long ovipositors.

Harris thus speaks of the injuries done by crickets:—"Where crickets abound they do great injury to vegetation eating the most tender parts of plants, and even devouring roots and fruits whenever they can get them. Melons, squashes, and even potatoes are often eaten by them, and the quantity of grass that they destroy must be great, from the immense numbers of these insects which are sometimes seen in our meadows and fields." (Ins. inj. to Veg., p. 151).

The crickets, especially *G. neglectus*, are often troubled with that strange parasite the Hair-snake. The Vice-President of the Quebec branch of our Society observed five of these creatures wriggle away from a cricket that a gentleman had struck down with his walking-stick—*they did not stay upon the order of their going.* The puzzle is, how did they find their way in? This is a greater puzzle than that which perplexed King George III. The monarch—so the story runs—one day entered a farm house, where he was at the time unknown. The owner and his family were just sitting down to dinner, and hospitably invited the respectable old gentleman, who had walked in, to partake of the meal. The King graciously accepted the invitation. Among the dishes served was one of boiled apple-dumplings. In due course the King took one of these upon his plate. He examined it with interest. He could see no marks of stitches, nor other sign of a junction in the crust; and, mentally giving up the riddle, he exclaimed "However did the apple get inside the dumpling?"

The hair-snake is certainly found inside the cricket curled round, like the spring of a bird-trap, under the skin of the insect. There it thrives, imbibing the juices of its host; but how it got there is as yet a mystery.

I have mentioned the ground beetles that feed upon the eggs and young of the crickets. Our largest Quebec species is the Copper-spot Ground-beetle, *Calosoma calidum* Fab. (Fig. 51). The beautiful metallic spots on the elytra of this handsome insect make it easy of recognition. We have other fine beetles of predaceous habits. Amongst them is *Carabus mæander* Fisch., a brown beetle of elegant shape, and with elytra finely sculptured with raised lines and rows of oblong spots. This insect is not uncommon at Quebec, but is rare in other parts of the province. *Cychrus viduus* Dej., is another handsome beetle, purple in colour, with striated elytra, and a large cordate abdomen. This last named species is said to regard slugs and land-snails as high-class food. But,—

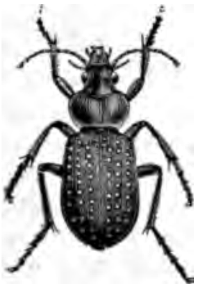

Fig. 51. The Copper spot Ground-beetle.

"*Revenons à nos moutons.*"

GRYLLUS DOMESTICUS, LINN (the Domestic Cricket).

During the autumn months of this year a cricket enlivened my house with its nightly serenade. Its place of abode was amid the inequalities between the mantel and the brick-work of the kitchen fire-place; and its favourite position was to stand head downwards, with so much of its body protruded from beneath the mantel as would allow of the free play of its wing-covers. With these appendages constantly vibrating, and with its long antennæ moving backwards and forwards, as if to catch the slightest pulsations in the air that might tell of danger, it would remain for hours. It did not seem to be afraid of light. I could approach warily, lamp in hand, within a yard of it, and watch its motions; but on the slightest aggressive movement it would dart backward to its retreat. It was about eight lines in length of body, of an ochreous colour with brown and white markings. The veins of the wing covers were brown. The antennæ, palpi, tarsi and abdominal appendages were of a dull yellow. The last named were fringed.

The call of the insect was kept up till the middle of October, when it gradually became fainter and at length ceased.

CEUTOPHILUS MACULATUS, DE GEER (the Wingless Cricket).

A few seasons ago I had the opportunity of watching a wingless cricket as it sent forth its shrill "chirrup." Its hindmost pair of legs were moved up and down rapidly and their spin shanks brought to bear upon the edges of the abdominal plates. The combined friction and vibration produced the notes. The movement reminded me of that of the "up-and-down saw" in an old fashioned saw-mill.

The insect is the *Ceutophilus maculatus* of De Geer, and comes in the Locustaridæ; but, as Harris calls it "the spotted, wingless cricket," and its call is a cricket's call, it seems fitting to speak of it here.

The creature can be easily recognized by its rounded back, its brown colour mottled or potted with yellow, and its lack of alar appendages.

It is from 6 to 8 lines in length of body, and it has remarkably long antennæ and hind limbs.

There are other creatures that help to swell the concert that in the autumn evenings so deeply impresses us with the sense of the abundance of insect life; but those we have spoken of—with their violins, banjos, and tambours—are the strength of the musical company.

ERRATUM.

The Rev. Dr. Fyles drew attention to a printer's error on page 54 of the Thirty-first Annual Report, line 17 from the bottom, where the word "stainy" is printed in place of *satiny*.

NATURE STUDY LESSONS ON MOSQUITOES.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

It is unnecessary to state that mosquitoes are interesting for more reasons than the purely scientific. Perhaps no other insect is so well known throughout the wide world, for savage as well as civilized man suffers from its bites. It tortures the Eskimo as much as it does the African or Venezuelan, and makes life almost unbearable at certain stages in the high Arctic regions.

The object of these lessons, however, is more to learn about its habits and life-history than to give information regarding the effects of its bite; although this latter phase is being studied very closely by scientific men at the present time, for it has been proved that certain species of mosquitoes are able to inoculate man with the organisms of malaria.

The best time to study the life-history of the mosquito is in the summer when the "wrigglers" are abundant in stagnant bodies of water. If a large glass jar be nearly filled with water from pools in marshy places, from ditches where leaves have accumulated, or from exposed rain barrels, a supply of mosquitoes in different stages of development can usually be obtained, and kept conveniently under observation. It would be well to cover the jar with a net of muslin to prevent the escape of the winged mosquitoes as they emerge.

The Eggs. Sometimes curious boat-shaped masses of eggs (Fig 52*a*) may be seen floating on some stagnant water. These should be secured, and put in the glass jar. An egg-mass consists of 200 or 300 spindle-shaped eggs, glued together. It readily rises to the surface if pushed below, and is none the worse of the ducking. It is probable that very few persons have ever seen the female in the act of laying her eggs, but it is supposed that the operation is performed in the early morning hours just before sunrise. The eggs hatch in about twenty-four hours after they are laid. The young "wrigglers," or larvae, make their escape from the underside of the eggs, by the opening of a lid.

The Wrigglers or Larvae. A careful watch over the inhabitants of the glass-jar will show how the wrigglers act. If some of them can be found at rest at the surface, it will be seen that they float with the head downwards, and the end of the body at the surface. (Fig. 52*c*).

At the mouth two tufts of bristles are in ceaseless vibration, and produce a continuous current of water, in which minute creatures are brought within reach as food.

The upper end apparently divides into two branches; one branch rises to the surface, the other branch, the true hind segment, and the larger branch, serves as a rudder. When a wriggler is disturbed it wriggles away, using the rudder to direct its course. It will be noticed, moreover, that the wrigglers make greater efforts in rising to the surface, than in sinking through the water. This shows that their bodies are heavier than water, and they must have some means of keeping themselves at the surface.

The branch (Fig. 52*c*) which rises to the surface is in reality the breathing tube of the wriggler. The upper end consists of a five-rayed rosette, which is spread out on the surface of

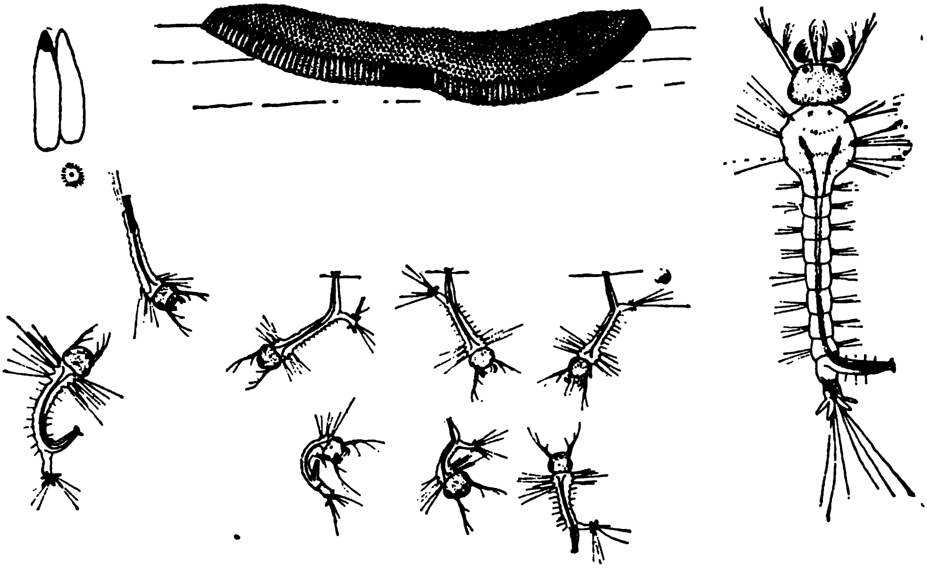

FIG. 52.—*Culex pungens*: Egg mass, *a*, with englarged eggs at left, *b*, and young larvæ below, *c*—enlarged. (From Howard, U. S. Department of Agriculture.)

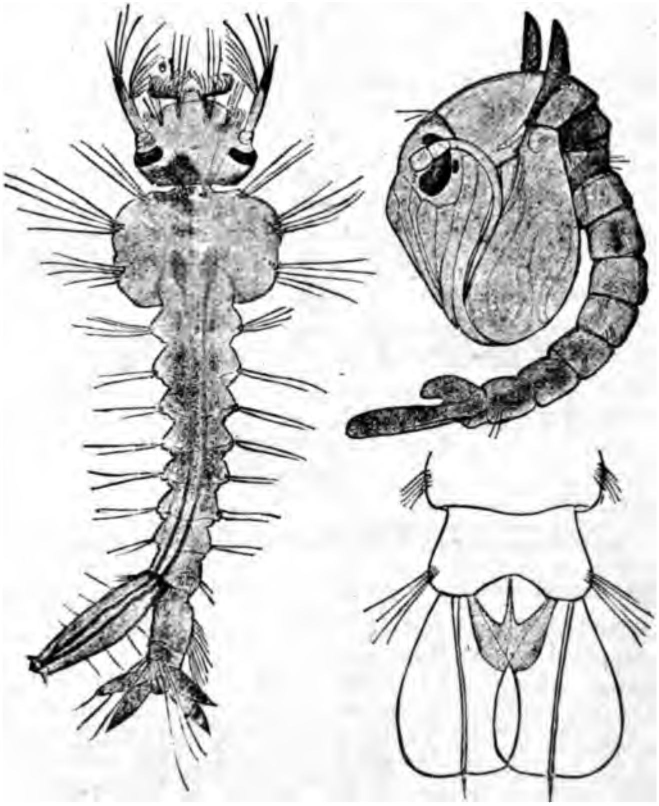

FIG. 53.—*Culex pungens*: Full grown larva at left, *a*, pupa at right, *b*—enlarged appendages of tail of pupa, *c*. (From Howard, U. S. Department of Agriculture.)

water. The tension of the surface film buoys up the rosette, and hence the wriggler itself. Through this breathing tube the insect, gets its supply of air. [Find out how long a wriggler can remain under water without coming to the surface for air.]

In nine or ten days, the wriggler assumes another shape—known as the *pupa*. [Determine how often the wriggler moults in this time.]

The Pupæ. They are considerably different in appearance from the true wrigglers. Their head-end is much enlarged (Fig. 53) and the insect is somewhat club-shaped. There is a difference also in their appearance when at rest. The head-end is at the surface, and the supply of air is taken in by two breathing tubes attached to the upper surface of the thorax portion of the enlarged end. Unlike most pupæ, the pupæ of the mosquitoes are active creatures, wriggling about in the water.

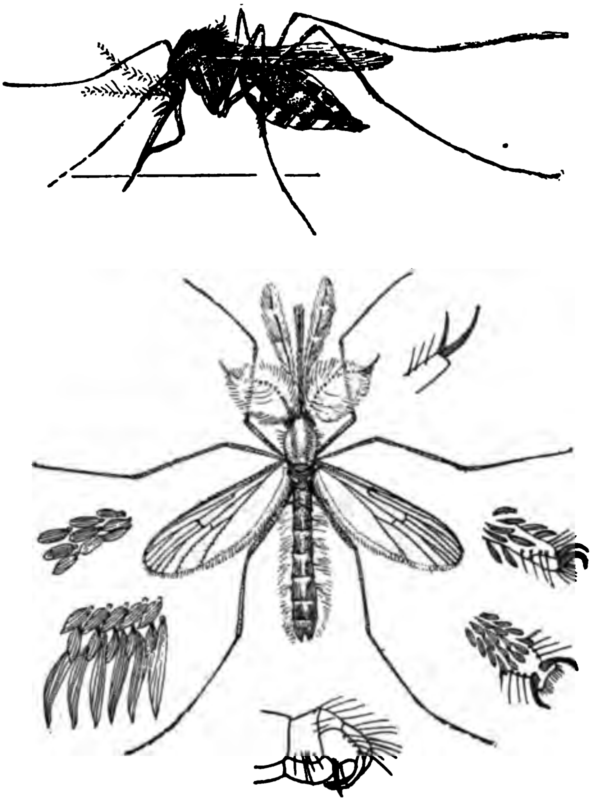

Fig. 54.—*Culex pungens:* Female above, male below,—enlarged. Scales on margin of wing; scales along veins of wing. (From Howard, U. S. Department of Agriculture.)

When a pupa-wriggler is disturbed, it becomes apparent that it makes greater exertions sinking than it does in rising. Its body, then, is lighter than water, and rests naturally at the surface without the aid of a special float.

During this stage, the mosquito develops the wings, legs, and the peculiar stinging mouth-parts, which are of such value to it in the adult stage. The rudiments of the wings and legs may be seen through the pupa-case, if a strong magnifying glass be used. In two or three days, the adult winged mosquito escapes from the pupa-case. (Fig. 54.)

The Adult Mosquitoes. When the time arrives for the emergence of the winged mosquito. the pupa-skin splits along the back, and the insect gradually raises itself on its long spindly legs using the old pupa-skin as a raft. It is nearly bent double as it pulls its wings out, but soon these become filled, and it is ready to escape. If the wings should get wet during this delicate operation on the unsteady raft, it is more than likely that the poor mosquito perishes. A quiet body of water, therefore, is necessary for the safe emergence of mosquitoes in large numbers.

Male and Female Mosquitoes. The male mosquitoes are readily distinguished from the female by the long-feathered antennæ. The males neither sing nor bite, and if they feed at all it is on the juices and nectar of plants. It is quite probable that the normal food of these insects is the juices of plants, but it is also quite certain that the females delight in the warm blood of animals, including man.

The Wings. Mosquitoes have but one pair of wings. The margins of the wings are fringed with hairs, and the veins with minute scales. The buzz-sound of the mosquito is made by the rapid vibration of the wings, about 3000 in a minute, and by the air passing over little drums at the openings of the air tubes of the sides of the body. The hind wings are represented by a pair of stalked knots, called "balancers."

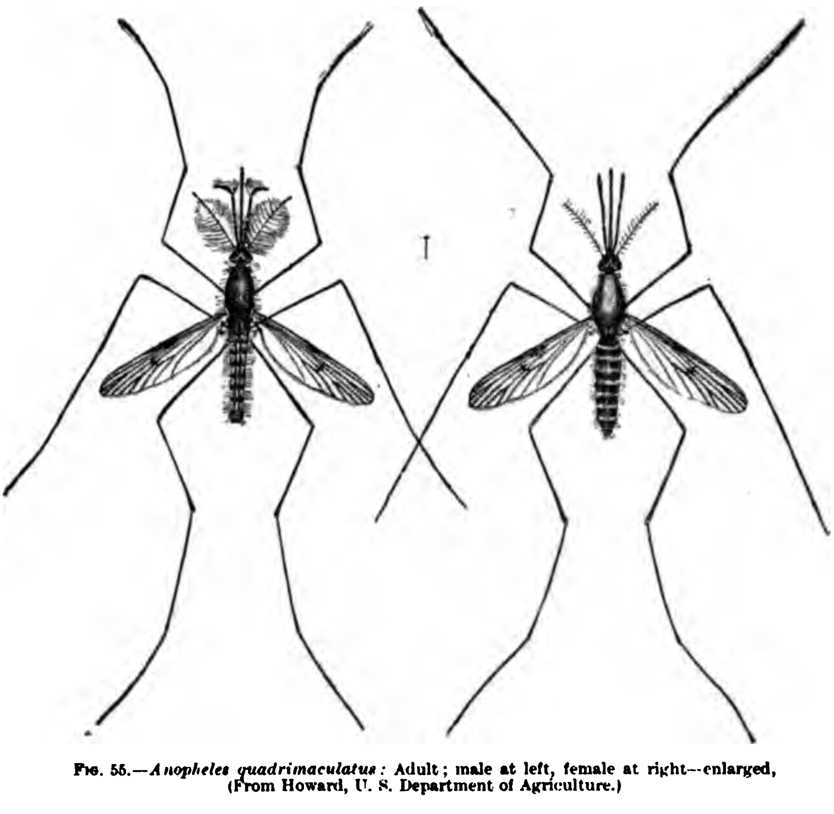

FIG. 55.—*Anopheles quadrimaculatus:* Adult; male at left, female at right—enlarged. (From Howard, U. S. Department of Agriculture.)

The Mouth Parts. These are to many persons the most interesting portion of the anatomy of the mosquito. The mouth-parts of the males are simpler than those of the female, and consist of but three parts, the sucking proboscis and the two palpi, one on either side of the proboscis or sucking-tube.

The females have a long slender upper lip, five slender lances, and a large proboscis with two short palpi (Fig. 55). When a female mosquito alights on the skin, she pierces it with the "bill" composed of the upper lip and the five slender lances, and the blood is drawn up through the proboscis into the stomach.

Kinds of Mosquitoes. There are several genera of Mosquitoes, two of which are common, viz., *Culex* and *Anopheles*. The former, however, is by far more abundant, and the species *pungens* is the *Common Mosquito.*

Anopheles is important as it is the agent in the inoculation of the human body by malaria. The female Anopheles may be distinguished readily from the female Culex by the length of the palpi on each side of the proboscis. In the former the palpi are almost as long as the proboscis, while in the latter they are quite short. (Fig. 55.)

The resting position of mosquitoes is an interesting study, which may be carried on both summer and winter. In winter the adults cling to the ceilings of attics and basements. [What is the characteristic resting attitude of Culex on the ceiling and the vertical wall?] (Fig. 56.)

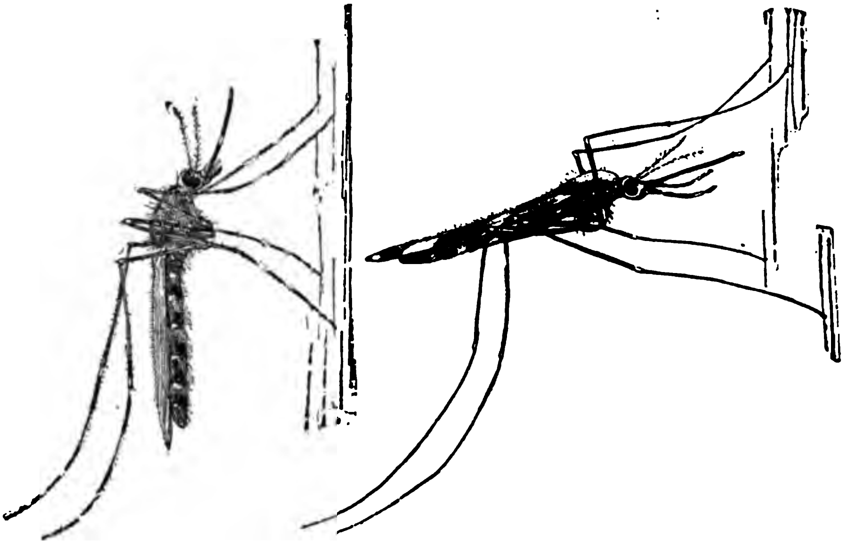

FIG. 56.—Resting positions of Culex (at left) and Anopheles (at right), enlarged (redrawn from a rough sketch published in the British Medical Journal. (From U. S. Department of Agriculture.)

How to rid a locality of Mosquitoes. Dr. Howard, of Washington, mentions three methods: 1. "By the drainage of the swamps or pools in which the mosquitoes breed." 2. "By the use of kerosene on the surface of the waters in which they breed." 3. "By the introduction of fish into fishless ponds so that they may eat the wrigglers."

Practical Exercises.

1. How far do mosquitoes fly from their breeding places?

2. Collect a large number of mosquitoes during the summer, and determine, 1. the number of males, 2. the number belonging each to Culex and to Anopheles.

3. The effect of the use of Kerosene on the breeding places of mosquitoes (use 1 oz. for every 15 sq. ft. of surface).

4. Full-study of life-history of Culex.

ENTOMOLOGICAL RECORD, 1901.

BY DR. JAMES FLETCHER, OTTAWA.

Canadian students of Entomology, in the past, have had many obstacles to overcome before they could advance sufficiently in their studies to obtain that encouragement which is necessary to incite continued effort. Congenial companionship is undoubtedly the greatest and most useful help that any student can be blessed with in any line of research. It is manifestly of great advantage to know who is working at the same studies as ourselves and what others are doing, so as to correspond, compare notes and learn as soon as possible all that is to be known about any subject in which there is a mutual interest. We all know how the accidental capture of a rarity, or a chance incident, may direct our particular attention to some class of insects or some entomological problem which but for this accident might never have come before us.

Having for many years felt the want of this information, it has occurred to me that if there were published every year in the Annual Report a record of the important entomological events of the year, it would be of considerable use to every one interested in Canadian entomology. The plan of this Entomological Record may well, I think, be discussed by the members, and I shall be very glad to receive suggestions as to the most useful way of preparing it in future. The kind of information which it seems to the writer would be of use, will fall under the following heads:— (1) A record of special rarities taken by collectors, with the various localities and dates, which for ease of reference should be arranged under their natural orders and in the sequence of some recognised check list. (2) The names of specialists who have devoted particular attention to some order, genus, species, or phase of entomological study. (3) The names of any books of note affecting entomology, or connected with any branch of it, which may have been published during the year.

It is not proposed to include in this record, except perhaps in an incidental manner, facts connected with Practical Entomology. This subject will be fully treated of in "Notes of the Year" and other papers included in the Report.

The compilation and preparation of this Record need not always be done by the same person. I merely on this occasion submit a short outline or scheme, as a beginning, and, if my opinion as to its value is correct, I feel sure that year by year it will be improved in form. As soon as collectors and workers in entomology know that this will be a regular annual record, they will themselves send in notes of their work and requests for information, which will make it continuously more and more useful; indeed it will be better, that this record should not be always prepared by the same person when the final form in which it should be drawn up, has been decided upon, and I would suggest that at each annual meeting the council should request someone to undertake the work for the ensuing year, and then publish their choice, with the address of the compiler, in the "Canadian Entomologist" for January each year, so that collectors may know to whom records should be sent. These records of captures, or requests for information, should be sent in from time to time, and should not be held over until the end of the year, or there is great danger of their being forgotten.

Needless to say, every care must be taken that the identification of all species mentioned should be as accurate as possible, and doubtless considerable correspondence may be required and in some instances specimens may have to be examined; all this takes time, and will show how inconvenience may arise from records being sent in at a late date before the annual meeting.

In the meantime I shall be glad to receive notes on the above mentioned subjects, or advice as to improvements for the Record of 1902. The present article is merely suggestive—a beginning—and may be changed and improved to an unlimited degree.

THE SEASON OF 1901.

The season of 1901 in almost all parts of Canada has been characterised as "poor" by nearly all collectors heard from. Of those who have favoured me with notes, there are only two who have made satisfying collections, either as to species or as to numbers of specimens, viz. Mr. A. F. Winn, of Montreal, Que., and Mr. J. D. Evans, at Trenton, Ont. Such reports as "The poorest year I have ever known," "Remarkable for the absence of good species", "I never took so few good things", "Insects of all kinds scarce", etc., are almost universal. The only exceptions to this general statement in the reports received, were with regard to the unusual abundance in the West of *Pyrameis cardui* and *P. atalanta* and through the whole of Canada of *Pieris rapæ*. In all parts of Ontario, the noticeable insect of the season was the Birch-Tree Skeletonizer (*Bucculatrix canadensisella*). In Manitoba and the North-west Territories the moths of *Noctua clandestina* were found during July in myriads inside houses, to which they had doubtless been attracted by lights.

LITERATURE.

Bibliographical notes on entomology appear regularly in all entomological journals and scientific magazines, such as "The Canadian Entomologist," "The Ottawa Naturalist," "Entomological News," "The American Naturalist," "Science," etc. These are all indispensable to the working entomologist.

Howard (L. O.)—"The Insect Book." An event of very great importance as affecting the whole subject of entomology is the recent publication of Dr. Howard's "Insect Book." Up to the present time, the one great obstacle in the way of lovers of natural history devoting their attention to the study of insects, was the fact that there was no single elementary work of moderate price, which would enable a beginner to identify and classify his captures. This want has been to a large measure supplied by Dr. Howard, with his most useful work. Copiously illustrated and written in untechnical language, it has already commended itself to a great many beginners, especially boys and girls, and will I feel confident, together with Dr. Holland's beautiful "Butterfly Book," do more to attract students to entomology as a recreation and study, than all the works which have preceded it. Beginners have now a starting point from which they can easily make an appreciable advance towards a knowledge of most of our common forms of insect life. The beetles and moths are now the only insects requiring treatment in the same manner, and it is to be sincerely hoped that before long this lack will also be supplied. Some deficiencies of minor importance, in the Insect Book, due to hurried publication, will doubtless disappear in the next edition.

Important monographic works will be dealt with under the Orders of insects to which they refer. Mention, however, may be made here of the splendid report by Prof. J. G. Needham, of Lake Forest University, Illinois, on the "Aquatic Insects of the Adirondacks," lately issued by Dr. E. P. Felt, State Entomologist of New York, a charming report of excellent and original work in an almost unworked field, and one which is very suggestive as to desiderata, with regard to which facts may be supplied by workers in all parts of the country. A valuable feature of this work, as in the Insect Book, is the number of suggestions which are made as to useful lines of work which may be taken up to supply unknown data in the lives of well known insects.

GENERAL COLLECTORS.

Most collectors of insects, as their material accumulates, specialize their efforts and devote their attention to one or two orders. There are a few, however, who keep up their general collections and who are always glad to correspond and exchange specimens in all orders. This, of course, is the case with the curators of public institutions, such as museums, colleges and schools. In addition to these the following are active workers in Canada:

Begin, Rev. P. A., Sherbrooke, Que.
Bethune, Rev. C. J. S., London, Ont.
Coubeaux, Eugene, Prince Albert, Sask.
Desrochers, Rev. J. E., Rigaud, Que.
Evans, J. D., Trenton, Ont.
Fyles, Rev. Thos. W., Levis, Que.
Gregson, Percy B., Waghorn, Alta.
Huard, Rev. Victor, Quebec, Que.
Lochhead, Prof. W., Guelph, Ont.
McIntosh, Wm., St. John, N. B.
Stevenson, Charles, Montreal, Que.

It will be noticed that most of the notes collected for this year's record are on the work of lepidoterists and coleopterists. A short report has kindly been prepared on Orthoptera by Mr. E. M. Walker, of Toronto, and data have been supplied for that on Hymenoptera, by Mr. W. H. Harrington, of Ottawa. Several collectors are devoting some attention to Diptera and Hemiptera, and it is hoped that by next year this material may provide data for a more extended notice of work in these orders, than is possible now. Canadian collectors are under deep obligations to the leading specialists in the United States, who at all times have most generously named material from all localities, whenever sent.

General collectors of insects frequently ask for a list covering all orders of insects, so that they may know how to arrange their collections. In most orders there is some one check list which is recognized generally; this should be used in arranging a collection. Probably the best general list covering all orders is Dr. J. B. Smith's "Insects of New Jersey," which is a catalogue up to 1899, of all insects found in that State.

LEPIDOPTERA.

By far the largest number of notes received refer to the Lepidoptera. For that reason, on this occasion, these insects will receive first attention. Species are referred to, not always for their great rarity, but when it is thought that a note of the occurrence in a certain locality, or upon a certain date, may prove of interest to other collectors. The species are mentioned in the order of Dr. J. B. Smith's "List of the Lepidoptera of Boreal America," 1891. Of works relating especially to Lepidoptera which have appeared in 1901, first mention should be made of Mr. Beutenmüller's beautiful "Monograph of the Sesiidae of America North of Mexico," published as a Memoir of the American Museum of Natural History, with eight magnificent plates. By the same author is a very useful "Descriptive Catalogue of the Noctuidæ found within Fifty Miles of New York City." During the year several valuable articles containing descriptions of new species have appeared, by Prof. J. B. Smith, of New Jersey, and Dr. H. G. Dyar, of Washington.

The following list gives the names and addresses of some of the most active students of Lepidoptera in Canada. There are doubtless many others, but I have not been able to learn what they have been doing during 1901:

Anderson, E. M., Victoria, B. C.
Bethune, Rev. C. J. S., London, Ont.
Boger, H. W. O., Brandon, Man.
Brainerd, Dwight, Montreal.
Bush, A., Vancouver, B. C.
Cockle, J. W., Kaslo, B. C.
Criddle, Norman, Aweme, Man.
Danby, W. H., Rossland, B. C.
Dennis, A. J., Beulah, Man.
Dod, F. H. Wolley-, Calgary, N. W. T.
Evans, J. D., Trenton, Ont.
Fyles, Rev. Thos. W., Levis, Que.
Fletcher, James, Ottawa.
Gibson, Arthur, Ottawa.
Grant, C. E., Orillia, Ont.
Gregson, Percy B., Waghorn, Alta.
Hanham, A. W., Victoria, B. C.
Harvey, R. V., Vancouver, B. C.
Heath, E. F., Cartwright, Man.
Johnston, James, Bartonville, Ont.
Jones, W. A. Dashwood-, New Westminster, B.C.
Lyman, H. H., Montreal.
McIntosh, Wm., St. John, N. B.
Marmont, L. E., Rounthwaite, Man.
Moffat, J. Alston, London.
Norris, A. E., Montreal.
Richard, A. E., Ottawa.
Sandercock, W. C., Lauder, Man.
Suffield, J. D., Morden, Man.
Taylor, Rev. G. W., Wellington, B.C.
Venables, E. P., Vernon, B. C.
Winn, A. F., Montreal.
Wilson, E., Vancouver, B.C.
Wilson, T., Vancouver, B.C.
Willing, T. N., Regina, Assa.
Young, C. H., Hurdman's Bridge, Ont.

Of the above named, the following have made specialties of some subjects: Messrs. Brainerd, Cockle, Fyles, Fletcher, Gibson, Lyman and Young have given much attention to and are keenly interested in rearing species from the egg to the perfect insect. The Division of Entomology of the Experimental Farms is particularly interested in working out the life histories of insects, and will be grateful for all eggs or larvæ, which may be sent in by correspondents, particularly of Arctiidæ, and also of Acronycta, Agrotids and diurnals.

There are now many more interested in the study of insects than was the case a few years ago, and naturally the members of our Society have taken an active part in bringing their favourite field of research before others. Excellent work has been done by Mr. H. H. Lyman, in Montreal, by the encouragement he has always given to the members of the Montreal branch. In this work he has been ably assisted by several of the other members, notably by Mr. A. F. Winn. Similar good work has been done in St. John, N.B., by Mr. Wm. McIntosh, in Quebec by the Rev. Thos. W. Fyles, and in Vancouver by Mr. R. V. Harvey. In London the Rev. C. J. S. Bethune has put new life into the local branch. Too much cannot be said of the courtesies of Mr. J. Alston Moffat, the efficient curator of the Society's collections, to whom all our active collectors are frequently under obligations in many ways. The Toronto Branch has, during the past year, made material progress in arranging the collection of insects presented by them to the Education Department for Ontario.

NOTES ON CAPTURES.

RHOPALOCERA. *Melitæa harrisii*, Scud. Fairly common in one locality at Orillia. (Grant.)

Phyciodes batesii, Reak. This species, which is much rarer than *P. tharos*, occurs at Ottawa and Aylmer, Que., a week or ten days sooner than the latter species. (Fletcher.)

Euptoieta claudia, Cram. A female of this species was taken at Regina on July 10, while in the act of laying its eggs on *Linum sulcatum*. Four eggs were seen to be deposited on separate plants, so that this flax, a curious food plant for an Argynnid, seems to be the natural food of the caterpillars in that district. It is also known to feed on violets, and has even been troublesome in gardens in the West from attacking pansies.

Grapta satyrus, Edwards. A fair specimen that had wintered. May 5, Orillia. (Grant.) This species is rare east of the Rockies, but very common on the Pacific coast.

Vanessa californica, Bdv. A few specimens. New Westminster. (Jones.) This butterfly is very seasonal in its appearance. It was reported as swarming in the mountains round Kaslo, B.C., by Mr. Cockle, last year. A few specimens high up on Mount Che-am in the middle of August, where it was very troublesome in disturbing more desirable species. (Fletcher.)

Junonia cœnia, Hbn. A fairly good specimen in a cutting on the railway. Orillia. (Grant.)

Limenitis weidemeyerii, Edw. One or two specimens of this species were found in the collection of Mrs. Walton, at Armstrong, B.C., where she had collected them.

Debis portlandia, Fabr. A few specimens of this butterfly have been taken at Ottawa in 1901, July 10. (Richard.)

Erebia vidleri, Elwes. In addition to the six previously known examples of this fine species, about two dozen more were taken on the 15th and 16th August last on Mount Che-am, B.C., by the writer and Messrs. A. Bush and T. Wilson, of Vancouver.

Hipparchia ridingsii, Edw. Regina, July 10. (Fletcher.) This species has also been taken in some numbers at Aweme by Mr. Criddle.

Chionobas jutta, Hbn. Mer Bleue, near Ottawa, May 31. (Gibson.)

Thecla nelsoni, Bdv. Not uncommon at Kaslo in spring. (Cockle.) This is the first record of the species being found in Canada.

Chrysophanus xanthoides, Bdv. Brandon, Man. (Boger.) Several specimens.

Lycaena scepiolus, Bdv. This common western species seems to be gradually extending eastward. Four years ago a single specimen was taken at Nepigon. Last year in the beginning of July it simply swarmed in localities where in previous years, although visited at the same time of the year, no trace of it was seen. (Fletcher.)

Lycæna couperii, Grt. This species has never been recorded for western central Ontario, but Mr. A. W. Hanham writes that he took several specimens May 17, 1891, "two miles up from Brantford, close to the Grand River, via the Paris River road." Collectors in western Ontario should be on the lookout for the species.

Lycæna shasta, Edw. Some years ago Mr. F. H. Wolley-Dod took a single specimen 24 miles south of Calgary, but the species then disappeared. During the past summer he was fortunate enough to secure three or four more specimens. The locality seems rather far from the mountains for this species, and it is probably the farthest eastern limit in Canada. The altitude of Calgary is about 3,400 feet above the sea level.

Lycæna comyntas, Gdt. One specimen at Aylmer, Que., June 6, the second record only in the Ottawa district. (Gibson.)

Neophasia menapia, Feld. The mode of occurrence of this species in British Columbia is very remarkable. In certain years it swarms in countless myriads, the caterpillars feeding on the coast upon the foliage of the Douglas Spruce, but in the interior on the Bull Pine, *Pinus ponderosa*. Towards the end of the season, in August, the dead butterflies may be seen in vast numbers floating on the sea around Vancouver Island, or thrown up along the beach in windrows sometimes an inch or two in depth. A few specimens were seen flying in the Nicola valley on August 18 (Fletcher), and Mr. Dashwood-Jones reports that a few specimens were also taken at New Westminster.

Pieris protodice, B.-Lec. One specimen flying around golden-rods Sept. 21. The first record for Ottawa. (Fletcher.)

Colias eurytheme, Bdv. Remarkably abundant at Orillia. (Grant.) A few at Ottawa in September. (Young.)

Colias christina, Edw. Langvale, Man., June 5. (Sandercock.)

Pamphila hobomok, Harr. I have endeavored to hear of any instance of true *P. zabulon* being taken in Canada, but so far have failed. The differences between these two species are well shown by Dr. Skinner on plate 19, Entomological News, Vol. X. It would be well if Canadian collectors would examine their specimens and see if we have *P. zabulon* in Canada.

Eudamus bathyllus, S. & A. Three specimens of this butterfly, which differs from the somewhat similar *E. pylades*, Scud., by the absence of the sexual costal fold in the males, were taken by Mr. James Johnston at Hamilton, last year. Although frequently recorded from Canada, I believe that these are the first specimens which have been examined critically.

Pyrgus tessellata, Scud. A fine fresh specimen at Orillia Park, Sept. 21. (Grant.)

HETEROCERA.

Lepisesia ulalume, Strk. This rare and beautiful species has been taken several times at New Westminster by Mr. Dashwood-Jones. Mr. Harvey took a specimen this year at Vancouver. Whether it is a true species or merely a western representative form of *L. flavofasciata*, Barnst., requires investigation. Specimens of *ulalume* in some instances show very little of the black collar and have the secondaries more or less clouded with yellow. As a rule, the western form is larger than *flavofasciata*, but seems to bear the same relation to it that *Nisoniades juvenalis* does to *N. propertius* of the West.

Sphinx canadensis, Bdv. Two fine specimens of this rare hawkmoth were taken at Ottawa, June 10 and 12. Mr. Gibson, the captor, recognizing them as different from anything he had seen before, even on the wing.

Ampelophaga versicolor, Harr. Montreal, July 14. (E. D. Wintle.)

Smerinthus cerisyi, Kirby. A beautiful specimen at light, Orillia, May 20. (Grant.) Trenton. (Evans.) Rare in Eastern Canada.

Sannina exitiosa, Say. St. John, N. B. (McIntosh.) As no peaches are grown at St. John this record is interesting.

Alypia Mac-cullochii, Kirby. Montreal Island, June 1. (Stevenson). This is an interesting record. The species is common in the far East, whence it was described, also at Nepigon and in the Rocky Mountains. I have several times found the larvæ on *Epilobium angustifolium* at the latter localities and obtained the moths the following spring.

Heterocampa marthesia, Cram. A beautiful specimen of this fine moth was bred from a larva found on the ground in a beech wood at Ottawa during Sept. 1900. The moth appeared the following June. (Fletcher.)

Heterocampa biundata, Walk. A fine female was taken at light June 15, Ottawa. (Fletcher.)

Eacles imperialis, Dru. Two at light. "I never came across this till 1900." Orillia, June 24. (Grant.)

Hepialus sequoiolus, Behr. A fine specimen of this rare species was taken at Vancouver by Mr. E. Wilson ; it has been previously taken at Victoria by Rev. G. W. Taylor.

Hepialus mustelinus, Pack. One specimen, St. John, N.B. (McIntosh.)

Euthyatira pudens, Gn. One at light, the peach-blossom tint very pronounced. May 2, Orillia. (Grant.)

Semiophora youngii, Sm. ms. This new species was reared from the larva and collected by Mr. Young last season. Mer Bleue, near Ottawa. Aug. to Sept. (Young.)

Peridroma astricta, Morr. Kaslo, B. C. (Cockle.) Mr. Cockle sent eggs to Ottawa under date July 30. The larvæ were full grown in October. Cartwright, Man. (Heath.) Specimens sent by Mr. McIntosh from St. John, N. B., were identical with the western form.

Noctua substrigata, Sm. A fine specimen taken at Brandon. (Boger.)

Feltia robustior, Sm. A specimen of this newly described species was taken at Brandon. (Boger.)

Carneades quadridentata, G. & R. This species was recorded in Bull. 18, 1899, Nat. Hist. Soc. of N. B., by W. McIntosh (teste H. Strecker), "but the species has proved from better specimens submitted to Prof. J. B. Smith to be *C. detersa*. Three specimens were taken in 1901." (McIntosh). *C. detersa* is a widely distributed species and under the name of *C. pitychrous* is included in many lists.

Mamestra rugosa, Morr. Mer Bleue, near Ottawa, May 31. (Gibson.) A remarkably bright specimen, the first Ottawa record. Two specimens, St. John. (McIntosh.)

Carneades mollis, Wlk. (*C. fernaldi.*) Two or three specimens mid-July. (McIntosh.)

Homohadena badistriga, Grt. Several specimens bred from larvae found on honeysuckle. Ottawa. (Fletcher.)

Oncocnemis atrifasciata, Morr. A fine specimen of this beautiful moth, St. John, N. B. (McIntosh.) Rounthwaite, Man. (Marmont.)

Prodenia lineatella, Harv. Ottawa, October. (Fletcher.) Trenton. (Evans.)

Eupsephopæctes procinctus, Grt. This fine noctuid (two or three specimens) was taken at "sugar" at Brandon, Man., by Mr Hanham. Several specimens were bred by Messrs. T. Wilson and A. Bush, from troublesome cutworms feeding on vegetables in gardens at Vancouver, B. C., in company with *Peridroma saucia* in 1900.

Gortyna ærata, Lyman, n. sp., described in Can. Ent. XXXIII, No. 12, p. 319.

Achatodes zeæ, Harr. Several specimens of this neat little moth were bred from caterpillars boring in the young shoots of elder, *Sambucus*. Kingston and Ottawa. Imagoes July 6. (Fletcher.)

Tæniocampa oviduca, Grt. Trenton, rare. (Evans.)

Scopelosoma devia, Grt. St. John, N. B. (McIntosh.) One specimen. Had previously been taken here once before, May 15 ,1898.

Xylina thaxteri, Grt. One specimen Ottawa Apl. 23. (Young.)

Plusia thyatiroides, Gn. At light Aug. 24, Orillia. (Grant.) St. John. (McIntosh.)

Plusia dyaus, Gat. At flowers in town park, Orillia, Oct. 10. (Grant.)

Plusia flagellum Walk. St. John, N. B. (McIntosh.)

Catocala elda, Behrens. A few specimens, New Westminster. (Jones.) Vancouver. (Bush. This beautiful species which resembles the European *C. fraxini* much more than the American *C. relicta*, of which it is supposed to be a variety, was bred by the Rev. G. W. Taylor many years ago from a larva found at Victoria on Oak.

Erebus odora, Linn. This strong-winged wanderer from the West Indies has this year been reported from as far west as Calgary, where a specimen was taken by Miss Moodie of that place. Last year Mr. Hanham secured one at Winnipeg, and Mr. Dennis another at Beulah, Man. Mr. Grant took a perfect female "at sugar" at Orillia, July 6.

Homoptera woodii, Grote. "A beauty, at sugar," June 10, Orillia. (Grant.)

Leucobrephos middendorfi, Men. A pair of this rare and interesting moth taken at Aweme, Man., early in the spring, "extremely difficult to see and to follow." (Criddle.)

VARIETIES.

Argynnis lais, Edw. Some beautiful suffused varieties of this species have been taken at Aweme by Mr. Criddle, and during the past summer a handsome specimen somewhat resembling the figure of *A. platina* shown on plate 13, Ent. News, XII, No. 10, was taken at Beulah, Man., by Mr. Dennis. This specimen has three large basal silver blotches and a sub-marginal band of large silver spots. The primaries are more suffused with black than in the figure referred to. A fine painting of this and Mr. Criddle's own specimens were exhibited at the annual meeting.

Vanessa Antiopa, var. *Lintnerii*, Fitch. A fine specimen, with very wide border was this year bred at Ottawa, July 10th. This is not a true variety, but merely an accidental form which can be produced at will. (Fletcher.)

Lycæna neglecta, Edw. Mr. A. F. Winn caught last year at Bideford, Maine, on July 14th, a very fine gynandromorph of this species, the left side of which was female and the right male.

COLEOPTERA.

There are many who are collecting beetles in Canada, but, unfortunately, few records have been received, compared with those which have come to hand from lepidopterists.

The following are the names of some of the most active collectors :

Bethune, Rev. C. J. S., London, Ont.
Chagnon, Gus., Montreal, Que.
Crew, R. J., Toronto.
Evans, J. D., Trenton, Ont.
Fletcher, J., Ottawa, Ont.
Hanham, A. W., Victoria, B.C.
Harrington, W. H., Ottawa, Ont.
Keen, Rev. J. H. Metlakatla, B.C.
McIntosh, Wm., St. John, N.B.
Taylor, Rev. G. W., Wellington, B.C.

Mr. Keen has sent few records this year, but no one has done more to increase our knowledge of rare species from the extreme north-west coast than he has. He collected assiduously for many years on the Queen Charlotte Islands, and has recently moved to his present address.

NOTES OF CAPTURES.

Cicindela limbata, Say. Reported by Mr. Hanham as found on the sand hills bordering the Douglas swamp, Man., on June 18, 1899. "They looked like large white spiders skimming over the sand. I found them copulating buried in the sand, with just their heads showing."

Cicindela pusilla, Say. This rare species was taken by Mr. L. E. Marmont, at Rounthwaite, Man., and also by Mr. Hanham, at Bird's Hill, near Winnipeg, in 1900.

Cychrus tuberculatus, Harr. This rare and handsome species is occasionally taken in Vancouver Island. Comox, B.C. (Taylor, Fletcher, and Prof. J. Macoun.) The Rev. J. H. Keen found it not uncommon at Massett, on Queen Charlotte Islands. Two fine specimens were taken at Coldstream, twelve miles from Victoria, in June last. (Hanham.) The food of beetles of the genus *Cychrus* is generally stated to be snails, but Mr. Hanham writes: "I have found *Cychrus angusticollis* and *C. marginatus* in colonies in rotten stumps evidently preying upon slugs, which were with them. I think, for every snail they get here, they get one hundred slugs. I have caught *C. marginatus* in my garden feeding on slugs."

Cychrus angulatus, Harr. This very rare species has been again taken on Vancouver Island by the Rev. G. W. Taylor. Superficially, it resembles the black form of *C. angusticollis*, but has the thorax differently shaped, and the punctuation and striation of the elytra are quite different. "Near Brennan Creek, July 1, I have only seen three in nineteen years." (Taylor).

Carabus nemoralis, Mul. This interesting carab was first recorded by Dr. Horn as a Canadian species in 1891. Later in the same year Mr. Harrington took several specimens at St. John, N.B., associated with another European species, *C. granulatus*, Dej., and published a note in the Canadian Entomologist, 1891, p. 112. Mr. McIntosh now finds both of these species abundant at St. John, and speaks of *C. granulatus* as our commonest ground beetle.

Pasimachus elongatus, Lec., taken not uncommonly at Aweme. (Criddle.) Under stones in the Brandon Hills. (Hanham.)

Clivina pallida, Say. St. John, N.B., rare. (McIntosh).

Dicælus sculptilis, Say. "This species was not uncommon in Winnipeg in 1894. I have not seen a specimen since." (Hanham.)

Platynus clemens, Lec. Rare in Canadian collections. Originally described from Nova Scotia. St. John, N.B. (McIntosh.)

Platynus hardyi, Lec. This beetle has been taken on the sea shore in Nova Scotia in former years by Mr. Harrington; also, in numbers along the Nepigon River. (Fletcher.) Common, St. John, N.B., 1901. (McIntosh.)

Chlænius purpuricollis, Rand. One specimen taken at Brandon, September 27, 1900. Another was taken on almost the same spot, April, 1897. (Hanham.)

Chlænius interruptus, Horn. "In May, 1898 and 1899, this species was abundant along a short piece of railway line, two or three hundred yards, near Winnipeg." (Hanham.)

Tanyrhinus singularis, Mann. One flying October 24, 1898. Gabriola Island, B.C. (Taylor.) Massett, Q.C.I. (Keen.)

Adranes taylori, Wick. Two or three found in April and May in the nest of a yellow ant, Gabriola Island and Nanaimo. (Taylor.)

Mysia hornii, Cr. A few on currant bushes, Gabriola Island. (Taylor.)

Aphorista læta, Lec. Under bark of alder and hemlock, March to May, Nanaimo. (Taylor.)

Mycetina hornii, Cr. Nanaimo, May 22. One under bark of fallen fir, April 30. lor.)

Perthalycra murrayi, Horn, Nanaimo, May 22. (Taylor.)

Derodontus trisignatus, Mann. In fungi, Wellington, B.C., November. (Taylor.)

Nosodendron californicum, Horn. About 20 in a crevice of bark of *Picea grandis*, May 13th, Wellington. (Taylor.)

Acmæodera pulchella, Hbst., and *A. culta*, Web. Specimens of these pretty little Buprestians were taken on the flowers of Butterfly Weed, *Asclepias tuberosa*, at Komoka, Ont., July 13. (Bethune.) Neither of these species had previously been recorded from Canada.

Chrysobothris pusilla, Lap. and Gory. Ottawa, rare. (Fletcher, Harrington.) St. John, N.B. (McIntosh.) One specimen in each case.

Endeodes collaris, Lec. A few specimens of this rare species were taken by Rev. G. W. Taylor at Victoria.

Listrus motschulskii, Lec. Common on blossoms of Amelanchier at the end of April, Wellington, (Taylor.)

Polycaon stoutii, Lec. One specimen in twig of apple tree, Nanaimo, (Taylor.)

Molorchus longicollis, Lec. One on crab blossom, Gabriola Island, May 25. (Taylor).

Ulochætes leoninus, Lec. Two specimens on July 2 and 14, Nanaimo, and Gabriola Island. (Taylor.) Vernon, B.C. (Fletcher.)

Acanthocinus obliquus, Lec. Quite common on a fence near poplars, August and September, 1899; not seen since. (Taylor.)

Pachyta armata, Lec. Four specimens of this handsome beetle were taken flying round flowers, at an altitude of 7,000 feet, on Mount Che-am, B.C., August 15. (Fletcher.)

Anthophylax malachiticus, Hald. Six specimens flying low in a beech wood, Aylmer, Que., 1900, and eight specimens in the same place, June, 1901. (Fletcher.)

Anthophylax attenuatus, Hald. Three specimens, St. John, N.B., July. (McIntosh.) Ottawa, very rare; one specimen, June. (Young.) Another specimen was taken at Ottawa many years ago by Mr. Harrington.

Anthophylax mirificus, Bland. Both sexes. Vernon, B. C. (E. P. Venables.)

Leptura Matthewsii, Lec. Pine Creek near Calgary (Wolley-Dod). Vernon, B.C. (E. P. Venables)

Priognathus monilicornis, Rand. A widely distributed but usually rare Œdemerid. One specimen under log, St. John. (McIntosh.) Several flying in May, Wellington, B.C. (Taylor.)

Rhinosimus pallipes, B. and L. One only, April, 24. (Taylor.)

Asclera nigra, Lec. Gabriola Island; four specimens. May 13-15. (Taylor.)

Orchesia ornata, Horn. One on apple blossoms, May 4; Gabriola Island. (Taylor.)

HYMENOPTERA.

Some good work has been done in this order during the season. The most active workers have been the following: Mr. W. H. Harrington, of Ottawa, who continuously adds to his own extensive collections and has also done good work in the way of identifying specimens and helping others. The writer gratefully acknowledges many favours in the determination of parasites bred from larvæ collected in the field and from scale insects. Mr. Chagnon, of Montreal, continues his studies of this order, and Rev. G. W. Taylor, of Wellington, Vancouver Island, has also added considerably to the knowledge of British Columbian Hymenoptera.

The attention of our own members may be profitably directed to the recent systematic work of Mr. W. H. Ashmead, of Washington, undoubtedly the highest authority on American forms. His monographic writings have added immensely to the knowledge of these insects, and his recent scheme of classification marks a great advance upon that of Cresson, published in 1887. It has been adopted by Howard in his admirable "Insect Book." Such portions of the classification as have appeared must be carefully studied by all workers in this vast and difficult, but most interesting order. Ashmead divides the Hymenoptera into ten superfamilies, viz., *Apoidea*, *Sphecoidea*, *Vespoidea*, *Formicoidea*, *Proctotrypoidea*, *Cynipoidea*, *Chalcidoidea*, *Ichneumonoidea*, *Siricoidea*, *and Tenthredinoidea*. These are subdivided into ninety-four families. The parts of the classification already published are the following :—(1) The Ichneumonoidea, by the United States National Museum (Proc. XXIII., No. 1206), in which over eleven hundred genera are tabulated. (2) The Apoidea, in Trans. Am. Ent. Soc'y., 1899. (3) The Sphecoidea in the Canadian Entomologist for 1899 and (4) The Vespoidea (in part), in the same publication in 1900. The continuation of this most important and satisfactory work will be welcomed by all interested. It is much to be regretted that a larger number of our Canadian entomologists do not devote more attention to the Hymenoptera. Most attractive fields of study, with ample room for original observations, are offered in each superfamily, especially in connection with the social groups of bees, wasps, and ants, as well as in the great complex of parasitic species which play such an important role in the control of injurious insects in all orders. We trust that next year's record may be able to show that some useful work has been performed in this fertile field.

Among interesting captures mention may be made of the following :—

Bævs niger, Ashm. Reared at Ottawa from a batch of spider's eggs; 4 males and 20 females. (Harrington.)

Hecabalus lycti, Cresson ; and *Hecabalus utilis*, Cresson. Reared in large numbers at Ottawa from axe handles infested by the Powder-post Beetle (*Lyctus unipunctatus*). The parasites most abundant in June and October. (Fletcher.)

Abia kennicotii, Nort. One specimen at Trenton. (Evans.) This is by no means a common insect, although odd specimens are occasionally taken. The pretty white larvæ, spotted with yellow and black, may sometimes be found on Honeysuckle.

ENTOMOLOGICAL RECORD: ORTHOPTERA.

CONTRIBUTED BY MR. E. M. WALKER. (TORONTO.)

The marked progress that has been made in the study of North American Orthoptera during the past few years has shown no sign of abatement during the present year, although very little has been done to further our knowledge of the Canadian fauna, nor does the writer know of anyone in the country who is specially interested in this order. It is to be hoped that this state of affairs will soon pass away, since, owing to the tireless energies of Mr. Scudder, it is now a very simple matter to obtain the literature necessary to a student of the order. With Scudder's "Guide to the Classification of N. A. Orthoptera," the "Catalogue of N. A. Orthoptera," and the "Index to N. A. Orthoptera," the student should experience little difficulty in arranging his collection. The Index is by far the most important work on N. A. Orthoptera that has appeared during the present year, and too much can hardly be said in its praise. It is absolutely indispensable to the student, and contains remarkably few errors. One feature of this work, particularly, which is one of immense value, is the full list of localities given under each reference. By this means the student can learn accurately the distribution of any species.

Of other writings on Orthoptera published during the year, some of the more important are the revisions of several of the smaller genera by Scudder ; a few papers by Morse, such as "New N. A. Orthoptera" (Can. Ent., XXXIII., 129) ; "The Xiphidiini of the Pacific Coast," (Can. Ent., XXXIII. 201) ; "Revision of the Orthopteran Genus Trimerotropis," by J. McNeill (published by U. S. Nat. Mus.), are important papers, in which 24 new species are described ; and "Notes and remarks on Mexican Orthoptera, with descriptions of *new species*," and other papers, by J. A. G. Rehn. The "Insect Book," by Howard, must not be omitted, as it will be of great benefit to the beginner, and the plates will serve to give a good idea of the general appearance of most of the genera he is likely to meet with.

In regard to Canadian Orthoptera, it may be mentioned that, since the last instalment of the writer's "Notes on some Ontario Acridiidæ" was printed, he has added four more species to the number, and is now engaged in preparing a complete list of the Acridiidæ of Ontario. These four species are the following :—

Tryxalis brevicornis, L. Pt. Pelee, Aug. 8, 1901.

Orphulella pelidna, Burm. Sarnia, Aug. 12 and 14, 1901.

Trimerotropis huroniana, n. sp. Southampton, Aug. 20, 21, 29, 1901.

Paroxya floridana, Thos. Arner, Aug. 9, 1901.

Nothing of any importance has been written on the other families of Orthoptera in Canada, but the writer has for some years been making a collection of the Ontario forms, and will soon have a preliminary list of the Locustidæ ready for publication. Of the last-named family only eight species have been recorded from Ontario, and the lists from the other parts of Canada are no better. The writer, however, has taken twenty-two species in the province, seven of these having been taken for the first time this season. They are the following :—

Scudderia texensis, Pict.-Sauss. Pt. Pelee, Aug. 8 ; Arner, Aug. 9 ; Sarnia, Aug. 12, 14 ; Walpole Island, Aug. 13.

Conocephalus Nebrascensis, Bruner. Sarnia, Aug. 12.

Orchelimum nigripes, Scudd. Pt. Pelee. Aug. 7.

" *indianense*, Blatchl. Sarnia, Aug. 14 ; Arner, Aug. 8.

" *longipenne*, Scudd. Pt. Pelee, Aug. 8 ; Walpole Island, Aug. 13.

Xiphidium attenuatum, Scudd. Pt. Pelee, Aug. 8 ; Walpole Island, Aug. 13.

Atlanticus pachymerus, Scudd. Arner, Aug. 9.

Of the Gryllidæ and Blattidæ, the writer's collection contains a number of species as yet unrecorded from Canada. Of these, a few Gryllidæ were taken this year for the first time, *Nemobius palustris*, Blatchl., from Sarnia, Southampton, Owen Sound (Aug.), and Lake Simcoe (Sept.) : and *N. maculatus*, Blatchl. (Tobermory, Aug. 25), being noteworthy. The others have not yet been satisfactorily determined.

Collections of Orthoptera were made at the following localities during the past season :—

Toronto, Lake Simcoe, Leamington, Point Pelee, Arner, Chatham, Sarnia, Walpole Island, (St. Clair River) ; Goderich, Southampton, Tobermory, and other points in the Bruce peninsula and Owen Sound.

In addition to the above, collections of Orthoptera have been made at Aweme, Man., by Mr. Norman Criddle ; also in Central Manitoba and in the Okanagan and Nicola valleys, in British Columbia, by Dr. Fletcher.

A DAY AT THE MER BLEUE (EASTMAN'S SPRINGS, ONT.).

BY ARTHUR GIBSON, OTTAWA.

An excursion to the Mer Bleue at any time from April to November is always of keen interest to Ottawa entomologists. The nature of the locality, and the varied forms of life to be met with there, all tend to entice those who delight in observing and collecting specimens of natural history. The name Mer Bleue is applied to a vast peat bog, which at one point comes close to Eastman's Springs, Ont., and being in a comparatively undisturbed state, as far as the interference of man is concerned, naturally at once suggests itself as a favourite resort for naturalists. Local investigators have always considered this large swamp, and its immediate vicinity, a most lucrative point at which to collect. The members of the Ottawa Field Naturalists' Club have on several occasions journeyed in a body to Eastman's Springs to spend the day collecting, etc., and on all such excursions many interesting plants, insects, etc., have been found.

On the 30th May, 1901, Dr. Fletcher, Mr. W. E. Saunders, of London, Ont., Mr. C. H. Young, of Hurdman's Bridge, and the writer, spent a delightful and successful dav at the Mer Bleue. After a 12 mile drive from Mr. Young's residence on the Rideau River, about 10 a.m. we reached the house of our good friend Mr. Manus, who on all such occasions receives us hospitably and kindly allows us to "put up" our horse, etc., for the day. Mr. Manus's house is close to the edge of the swamp, and on the above mentioned date, as soon as we had donned rubber boots, or an old pair of ordinary boots, and ladened ourselves with collecting apparatus, lunch, etc., we immediately headed for the bog. The morning was rather overcast and there was just enough wind to keep down the mosquitoes, which naturally swarm on the bog. This advantage, however, somewhat prevented other and more desirable insects from flying.

Close to the swamp *Pyrausta octomaculata*, with its quick, flighty movements, was readily noticeable and very abundant. After passing through a rather obstructive thick growth of alder, which fringes the margin of the sphagnum carpeted bog, and wading in water sometimes up to our knees for about ten minutes, we reached the swamp proper and at once began collecting. Just at the entrance is a small cleared space of quaking bog covered with cranberries, and with a bubbling gas spring in the middle. Here we stopped a few minutes to drink the water, and to light the bubbles of gas as they rose to the surface. The first specimen found was a nice fresh example of *Hemaris thysbe*, which had just emerged, the wings being still quite soft. *Thecla augustus*, which is always a frequenter of the Mer Bleue, was the first diurnal taken, but it was a little late for perfect specimens. We were hoping to find the larva of this species, but we were too late. This Thecla is fairly abundant every season in this locality, and as nothing is known of the earlier stages of this interesting species, we were anxious, if possible to learn something about it. Several females were followed and watched carefully to see if we could detect them in the act of laying eggs. Dr. Fletcher has reared the closely allied *T. iroides* from caterpillars found feeding on green apples in Vancouver Island, and was of the opinion that the food of the larvæ of *T. augustus* would prove to be the green berries of the Blueberry, or the capsules of some Ericaceous plant, of which there were many kinds growing in profusion on the bog. The females rested for tantalizingly long periods on flower clusters of *Kalmia glauca* and *Ledum latifolium*, both of which were in flower, as well as on the now flowerless bushes of *Cassandra calyculata* which occurred everywhere, but not a single egg could be found.

Over the whole of this immense swamp the aromatic white-flowered Labrador Tea (*Ledum latifolium*), the Leather Leaf (*Cassandra calyculata*), the Sheep-laurel (*Kalmia glauca*), and the delicate Andromeda (*Andromeda polifolia*) were in great profusion. Flying among these, as well as among other plants, were hundreds of specimens of the following geometers, usually to be found in swamps at this season: *Nemaria grataria*, *Fidonia truncataria*, *Eumaturga faxonia*, *Semiothisa granitata*, and *Epirranthis obfirmataria*. It was a little late for these species, but nice examples of all were taken.

The most interesting discovery of the day occurred after we had been in the swamp for about an hour, when our attention was drawn to the destruction which had been wrought to the young tamarac and spruce trees (*Larix Americana* and *Picea nigra*). Many of these young trees, particularly towards the top, were denuded of their foliage. After a careful investigation of the branches and remaining leaves, without any insects being found, it occurred to us to examine the moss at the base of the trees. This was not in vain, for as soon as we began to remove the wet moss from the base of the trees, we discovered evidence of the presence of larvæ, by finding some frass, and upon further examination soon located the culprits. These caterpillars were from three to six inches below the surface of the wet moss, and of course were simply hiding during the day, until nightfall, when they would again ascend the trees and begin feeding. Later, however, Dr. Fletcher found a few specimens of the larvæ feeding on the foliage. The trees which were most attacked were small ones, from two to four feet high. About 25 specimens of the larvæ, in all, were collected, but unfortunately only those cared for by Mr. Young produced imagoes. The larvæ collected by Dr. Fletcher and the writer, although feeding well in confinement, and pupating in a healthy condition, failed to give the moths. Some of Mr. Young's specimens were forwarded by Dr. Fletcher to Prof. J. B. Smith, for identification, and the species proves to be a new one to science. In 1899 Mr. Young took one specimen of the moth at the Mer Bleue on the 30th August, and another specimen was taken by him in the same locality last year, early in September. Prof. Smith has named this species *Semiophora Youngii*, in honour of the discoverer. The caterpillar is from about an inch and a quarter to nearly an inch and a half in length, and, for a caterpillar, is a beautiful creature. A description will be given in the Annual Report of the Entomologist and Botanist, to the Dominion Experimental Farms for 1901. The moth is also a beautiful species, varying considerably both in colour and distinctness of markings ; it expands about an inch and a quarter.

As the morning was dull and cloudy, I was in hopes that the sun would come out, at least for a while, during the afternoon, as I was anxious to see *Chionobas jutta* flying, the Mer Bleue being one of the few localities in Canada where this interesting butterfly has been found. My hopes were not disappointed, for soon afterwards the clouds broke and the warm sun appeared in all its glory. It had hardly done so when just ahead of me I noticed a large brown butterfly flying rather quickly. Of course, I immediately gave chase, and in about a minute had netted my first specimen of *Chionobas jutta*, which proved to be a perfect female. Several other specimens were afterwards caught in tolerably good condition. This butterfly, although not very difficult to catch, has the habit of resting on dead branches and trunks of trees, where it is protected considerably by the resemblance of the under side of the wings to the bark, and where it is very difficult to catch.

In the twenty-fifth Annual Report of the Society, Dr. Fletcher published an article on the Pitcher-plant Moth (*Exyra rolandiana*). As neither Mr. Young nor I had ever seen the larva of this pretty little moth, we were anxious to see it at work, and were much interested when Dr. Fletcher, who knew its habits, called us to examine some infested pitcher plants (*Sarracenia purpurea*). We had not looked very long before specimens of the caterpillar were found, their presence being easily detected, as stated in the above article, by the brown dead patch on the leaf, where the caterpillar had fed for a time the year before and which showed plainly on the outside, also by the mouth of the pitcher having been drawn together somewhat, and the remaining space closed up with a web of fine silk. The caterpillar is an attractive one, as the following description, taken from Dr. Fletcher's article, will show : "Length when extended, three quarters of an inch ; spindle-shaped ; distinctly segmented ; general outline closely resembling the larva of *Xanthoptera semicrocea*, figured by Prof. Riley on page 208 of the Canadian Entomologist, Vol. VI, but lacking the fleshy processes of the abdominal segments ; head and first segments small; segments 2-7 gradually enlarging to 3 mm., and then tapering to the posterior extremity; each segment velvety claret colour, the velvety pile only in the central part of the segments; the intra-segmental sutures smooth, pale, in some specimens almost white; head white, marked symmetrically on each side with three black marks, the uppermost almost round, the middle one crescent-shaped, and the lowest above the ocelli, comma-shaped; spiracles brown, ringed with black; on each segment about six small black tubercles bearing slender tawny bristles; thoracic feet and prolegs darkened externally." The pitcher plant is very abundant at the Mer Bleue, and we soon found a number of the larvæ. These were in different stages of development, from about three-eighths of an inch to full grown larvæ. One pupa was also found in one of the plants. The moth "is a small, thick-set insect, about three-eighths of an inch in length, of a dark, metallic, purplish hue, which on the forewings is relieved by a yellowish discal patch. The base of the wings is deep red. The dark colour on the wings of the female is much blacker than in the other sex. The hind wings in both sexes are black. When at rest, the wings are sloped like those of a Plusia."

Lithacodia bellicula, a pretty little noctuid, was fairly common, and some nice fresh specimens were secured. Two other interesting noctuids were captured, viz. that beautiful, and extremely difficult to catch, little species, *Anarta cordigera*, which had been taken here before, and which we were specially on the look-out for, and *Mamestra rugosa*; one specimen of the former was collected by Mr. Young, and one of the latter by the writer, this being the first record of the occurrence of *M. rugosa* in the Ottawa district.

Argynnis triclaris always an interesting butterfly is also a frequenter of the Mer Bleue, but on account of its rarity few specimens are found. We were in hopes of meeting with this insect, and, although we watched for it throughout the day, no specimen was captured. A few Argynnids were noticed flying, and specimens of *bellona* and *myrina* were caught. Whether any of those observed were *triclaris*, we could, of course, not be sure. The species flies about a fortnight later, Dr. Fletcher having taken specimens at the Mer Bleue on the 11th June one year and on the 16th June another year.

Doubtless, if the weather had been more favourable, other interesting lepidopterous insects would have been observed. Specimens of coleoptera, hymenoptera and diptera were collected and some rather rare species secured. These insects would, of course, have been more plentiful, had the day been brighter.

While Dr. Fletcher, Mr. Young and the writer were occupied the greater part of the day in hunting for insects, or in collecting plants, Mr. Saunders who is an ardent ornithologist, armed with his field glass, was busily engaged the whole time "looking up" birds and studying their ways. Some nice nests, with eggs, of the Palm Warbler, the Nashville Warbler, the Swamp Sparrow, and the White-throated Sparrow, were secured, and many useful notes were made upon the habits of the birds mentioned.

We reluctantly turned our steps homewards as evening came on, well loaded down with specimens of plants and insects, and with some clutches of rare eggs, determined if possible to return again next year, a little earlier in the season, so as to tackle the problem of the food plant of *Thecla augustus*, and later to learn something of the life-history of *Chrysophanus epixanthe*, which swarms on the Mer Bleue about the 1st July.

COMMERCIAL ENTOMOLOGY, OR INSECTS AND INSECT-PRODUCTS MET WITH IN COMMERCE.

BY CHARLES STEVENSON, MONTREAL.

Everyone is familiar with the valuable place that the silkworm holds in commerce. But it would surprise many persons if told how many of those creatures familiarly known as "bugs" command a price in the market, and very incredulous some would be, if informed that the only too common "bed-bug," *Acanthia lectularia*, Linn., or "B-flat," as it was called by a musical wag, is used as a drug. A certain school of practitioners prescribe this pest in the form of a tincture, as well as another "bug-bear" of the cleanly housewife—the cockroach, the species *Periplaneta Americana*, Linn., being specified for the purpose. Not long ago, *Periplaneta orientalis*, Linn., the "oriental roach" or "black beetle," a native of Asia, which is now found in most parts of the civilized world, was recommended for the same use as the "blister beetle" or "Spanish fly," *Cantharis vesicatoria*, Linn,, which is an official drug in both the allopathic and homœopathic pharmacopœias. The Spanish blister beetle is indigenous to southern and central Europe, living on the ash, lilac and elder trees. It is of a brassy green colour, and is collected in Spain, Italy, Hungary and Southern Russia, but that which comes from the latter country is most esteemed and is larger and of a copper colour. Several American species are found to possess efficient vesicating properties ; among them may be mentioned the "potato-fly," *Epicauta vittata*, Fab., which has the thorax black and the wing cases with yellow stripes ; *E. cinerea*, Fab., a black species , *E. marginata*, Oliv., another black species, with ash-colored margins on the elytra ; *E. atrata*, Fab., uniformly black, and smaller than those previously mentioned. There is a species very abundant in Kansas and Colorado, *C. Nuttali*, Say, which closely resembles the true Spanish blister-beetle, and has also attracted attention in pharmaceutical commerce.

Two vesicating insects, *Mylabris cichorii*, Fab., and *M. phalerata*, Pallas, indigenous to East and South Asia, and also to some districts of Africa, are now imported as "Chinese blistering flies, and are found to be quite as efficient as the official insect. *Lytta gigas*, Fab., of the East Indies, is also sometimes met with in commerce.

The "oil-beetle," *Meloe majalis*, is prescribed in homœopathy as a tincture, to make which the living insect is drowned in alcohol.

If allopathic medicine were to give way to the doctrine of "*similia similibus curantur*,', farmers might be able to form a "combine" for the supply of the "Colorado potato-beetle,'› *Doryphora decemlineata*, Say, that insect being the base of a certain tincture, made by taking the living insects, one part, crushing them, adding five parts of alcohol, macerating for eight days in a dark, cool place, shaking twice a day, and then pouring off the liquid, straining and filtering. In the same way medicines are made of several spiders, and a trituration is prepared of the freshly-spun webs of the genus *Aranea*.

Although entomologists have often raised spiders for purposes of scientific observation and investigation, spider-raising as a money-making industry is somewhat novel. One has only to go four miles from Philadelphia on the Lancaster pike, to the farm of Pierre Grantaire, and see what can be found nowhere else in the United States, and abroad, only in a little French village in the department of the Loire. Pierre Grantaire furnishes spiders at so much per hundred for distribution in the wine vaults of merchants and the *noveaux riches*.

In some forms of practice several "live" insects that possess poisons are used in making tinctures ; they are irritated or aggravated so as to make them "throw off" by shaking or stirring them up in a jar or bottle. One of these creatures that is "first made mad" before the introduction to alcohol is the "hornet" *Vespa crabo*, Linn. ; another is the well-known "honey bee," *Apis mellifica*, Linn. Besides the tincture of the whole insect, the pharmacist prescribes the virus, to be obtained in the following way: "Draw out the sting, together with the poison bag, from a bee freshly killed. Take hold of the bag, insert the point of the sting into a small glass tube and squeeze the poison into it, or take a small bee with a pair of pincers and allow it to seize a small lump of sugar, which will absorb the poison." This hymenopterous fly is an important factor of the produce market, being the manufacturer of a wax much used for many purposes, and that sweet article of household use, as also in dispensing drugs—honey.

Other victims of the pharmacist are the bright-red minute Acarus *Trombidium muscæ domesticæ*, which the pharmacopœia states is "found under the wings of the common fly in Philadelphia." The aphis or plant louse of *Chenopodium glaucum*, and the red ant, *Formica rufa*, Linn. Nor does the gardener's friend, the "Lady-bird beetle," escape, for the "live insects" are "pounded to pulp" and triturated with sugar of milk.

It is recorded that the Greek barber surgeons of Asia Minor valued ants for holding together the edges of a cut. They held a large *Camponotus* in a forceps and when it opened its mandible, wide, it was permitted to seize the edges of the cut, which were held together for the purposes its head being cut off as soon as a firm grip was made. A similar practice was observed in Brazil several years ago by M. Morqueys of Rouen, and is cited by Sir John Lubbock but is not mentioned by either Bates or Wallace.

The bushmen of the South African district Kalahai set a high value on the leaf-beetle *Diamphidia*, as they use its juice and its larva for poisoning their arrow-heads.

For the Arts and Technical Sciences, there are several insects that are of great value. We have to thank a small Mexican scale-insect *Coccus cacti*, Linn. for the brilliant colour called cochineal which has superseded even the splendid and regal "Tyrian purple" of ancient days. It is used in the manufacture of dyes, paints and in pharmacy and also for coloring confectionery. It is of no value in medicine although it has been used as an "anodyne, tonic, astringent" Another important hemipterous insect is the West Indian *Coccus lacca*, Kerr. the female of which punctures the young branches of several tropical trees, thereby producing a resinous product called, lac, stick-lac, or shellac, used in the manufacture of varnishes, sealing-wax and a dye called Lac-lake. Indian cochineal is prepared from stick-lac and imported from India for coloring woollen and silk-goods. Its colour is similar to, but less brilliant than cochineal. *Coccus ilicis*, Fab. supplied the famous dye KOKKOS of the Greeks, Coccus of the Romans, Kermes of the Arabs, Cocchi of the Italians and Al-kermes of the Persians. Though a larger species than *C. cacti* its colour is inferior and less in quantity. Chinese-wax is the produce of a similar insect *Ericerus pela.*

In Syria a peculiar secretion called Manna is produced by the punctures of the female *Coccus manniparus*, Fab. on the young shoots of the *Tamarix mannifera*, Ehrenberg. It is a kind of reddish syrup containing glucose, dextrin, and cane-sugar, and is eaten by the Arabs and the monks of Mount Sinai like honey with their bread. There is another product which goes by the same name in the drug trade, but it is not the same, it consists principally of a sugar called mannite. There are several other saccharine products of insects which have been classed with Manna, but they are not entirely soluble in water. The term manna is more interesting historically than the article now known by that name. It was originally applied to the food so miraculously supplied to the Israelites during their wanderings in the wilderness. What that substance was we do not know. The natives around Mount Sinai believe that the substance collected by them is what the children of Israel fed on.

That rapacious insect, the migratory locust *Œdipoda migratoria*, Linn. is valued as an article of food in Arabia and Egypt. They appear in the markets preserved in brine or sun-dried and are even exported as an article of commerce. Some authorities claim that it is the insect which St. Matthew (III. 4) refers to when he says "John's meat was locusts and wild honey" and in Leviticus (XI. 22) we find that locusts constituted a common food among the Jews.

In Tokio, Japan, twelve varieties of katy-dids or bell-insects, are sold, nine of which are bred in captivity. The purchasers keep them in cages for the sake of their musical sounds, as we do song birds.

The essential constituents of ordinary writing ink are galls mixed with iron sulphate and gum. These galls are produced by a small hymenopterous insect *Cynips gallæ-tinctoriæ*, Oliver, on the *Quercus infectoria*, Oliver, of the Levant. That instrument said to be mightier than the sword is dependent on a very small creature for its power. There are many other galls but they are not much in demand.

It is well known that what is perhaps the richest and most elegant apparel which adorns the human race is the product of a caterpillar,—the silk-worm,—*Bombyx mori*, Linn. Much attention has been given of late to other silk producing larvæ, many of whose products are being found of service, especially :—*Philosamia cynthia*, Drury, the Ailanthus moth. *Antheræa mylitta*, Drury, the Tussah moth. *A. yamamai*, Guer. of Japan and several similar moths.

During recent years the exporting and importing of insects by Economic Entomologists has been resorted to, for the purpose of preying on other insects that may be destroying food-plants.

In closing this short review of the role of insects in the commercial world, attention might be called to the fact, that there are many persons who make more than a livelihood by collecting and selling Entomological specimens to collectors and curiosity hunters, the experiences and anecdotes of whom are often very entertaining.

THE FOOD OF THE GRASS SNAKE.

By J. B. Williams, F.Z.S., Toronto.

There was an article in the Annual Report for 1896 on Insectivorous Mammals,* and the relationship which they sustain, on account of their food habits, to Economic Entomology.

I find that the food habits of one of our Reptiles,—the little Grass Snake (*Liopeltis vernalis*, —are of considerable economic interest.

I have often tried to keep these snakes alive, but never, until recently, have been able to find any food that they appeared to relish ; but while looking under a plank one summer for earthworms and slugs with which to feed some Dekay's Brown Snakes that were in the same glass case with the green ones, I found several of the Noctuid caterpillars that go by the name of "cutworms," and put them in the reptile case with the earth-worms. They had not been in for a minute before the Grass Snakes seized and eagerly devoured them, though they had rejected all other food that had been previously put into the cage. They continued to take them readily until the supply of "cutworms" was exhausted, and then, as I could find nothing else that they would eat, I let them go.

People generally try to kill grass snakes if they find them about their lawns, but it is evident that they should be protected and their enemies killed. No bird could have reached these caterpillars in the position where I found them under the plank, but it was just the kind of place into which a snake could creep and obtain its food. They probably eat other smooth caterpillars, and where numerous would be a check on the dreaded "army worm," for from the eager way they devoured the cutworms, Noctuid larvæ evidently constitute one of their favorite foods.

The Grass Snake is a beautiful little creature and perfectly harmless. Its food habits show that it is very beneficial, and it should be protected in every way and not destroyed or wantonly put to death.

. Ont., 1896, 16-21.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

ANNUAL MEETING.

The third annual meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, on November 9th, 1901. The chair was taken by the Vice-President, the Rev. M. White. Many letters were received in support of the meeting, among them being a letter from Dr. James Fletcher, Dominion Entomologist, of kindly advice to the young people of the newly-formed Lacombe Field Club, and a letter from Mr. C. W. Peterson, Deputy-Commissioner of Agriculture, N.W.T. Mr. Peterson expressed particular satisfaction at the number of agricultural societies throughout the North-West Territories which had decided to encourage the Entomological Society by affiliating with it. This, he said, is a step in the right direction, and that if agricultural societies would more generally support such institutions they would more nearly fulfil the objects contemplated in the law under which they were organized. An earlier letter from Mr. Peterson was also read advocating the enlistment of the sympathy of the school teachers and trustees throughout the Territories in support of the movement.

Among those present at the meeting were two of the teachers of the Lacombe school and a number of the pupils of the school.

The Chairman, after some opening remarks, called upon the President, Percy B. Gregson, for his address, which we give as follows :

PRESIDENT'S ADDRESS.

"Ladies and Gentlemen,—We have now completed the third year of our existence as a society, and it has become the custom to review the progress we have made during the preceding year, and to consider what good we have done. By thus taking stock, as it were, of our conduct, we gain some light on the course we should pursue in the forthcoming year. In this vast new country a society of any sort to become popular has to enlist the sympathy and interest of the settler, and to do that it must show that its labors are identical with the farmer's welfare. When this is clearly understood the Society becomes a popular institution ; and this is one of the reasons why we have annual meetings. The chief work of the Society is to study and encourage throughout the land an interest in insects and plants and their habits, and a knowledge of the remedies used against such as are injurious. The time has passed when such a study was looked upon as an evidence of lunacy, and I believe we shall see, within the next few years, the introduction into every school in the country of a system of nature study. The young people must be encouraged to take an active interest in the subject. The study of insects is emphatically one which develops the powers of observation.

Some idea of the practical value of this subject to the farmer may be formed from the fact that the damage done by insects last year to the farming and gardening industries in North America amounted to many millions of dollars, and a glance presently at the list of injurious insects for 1901 will show that the Territories are sharers in this great loss. Farmers as a rule are wide-awake enough to anything which threatens their pocket, though it is strange how indifferent many of them seem when their crops are threatened by insects or weeds. They will allow, for instance, the wholesale destruction of turnips and cabbages by insects, when a few cents worth of hellebore and kainit, or Paris Green would have saved much of the crop. And farmers are just as culpable in the matter of weeds.

The question therefore arises,—"How does the Society propose to assist the Farmer ?" and in answering this let us first see what we have already done.

In the Society there are two branches of study,—Entomology and Botany. Under Entomology is included insects (noxious, beneficial, harmless, etc.,) and under Botany is included the study of their food, and the study of weeds and other wild plants. Firstly, then, addresses on insects or weeds have been given whenever requested at Farmers' meetings. About seven of these, besides some written addresses, have been given during the year at different places.

Secondly, the Society has distributed to every affiliated agricultural society (except to those but recently affiliated) a collection of ripe weed seeds, in little labelled bottles, of nearly every species of noxious weed within the Territories. This will enable any farmer, by applying to the Secretary of his Agricultural Society, to see what sort of weeds he has in his seed grain.

Thirdly, the Dominion Entomologist, Dr. Fletcher, has offered two prizes (standard works on Entomology) to the young folk of Lacombe district for (1) the largest collection of insects and (2) the best collection of noxious and beneficial insects, and the Society has supplemented these prizes by a cash prize of a dollar for the best collection of wild plants (including noxious weeds). There have been several young competitors. Prize No. 1 was won by Master Benj. H. Howell of Lacombe; prize No. 2 by Master D. E. Tipping of Waghorn, and that for wild plants and weeds, by Miss Lucy McL. Howell of Lacombe (all members of the Lacombe Field Club).

Foorthly, a Field Club has been formed of some of the young folk of Lacombe under the Society's auspices, and by the example these young people set, many of the prejudices against insects will, it is hoped, be dispelled. For instance, with what horror the dragon fly is often regarded. We hear them called "Devil's darning needles," and that they will sew up little boys' eyes and ears: and we hear of caterpillars and beetles that they will bite us; and many other similar prejudices exist. These prejudices really are harmful, because they lead our young folk into error, and on account of these prejudices many insects are cruelly destroyed which should be preserved, and on account, too, of them our young folk conceive a distaste for studying their habits.

Fifthly, the Society has distributed to non-subscribers some hundreds of copies of those two excellent agricultural papers, The Nor'west Farmer and The Farmers' Advocate. These papers, or one of them, should be taken by every farmer in the country. In addition to this, the Secretary of the Society has written (as replies) many scores of letters of advice on special noxious insects to farmers individually, with the remedies.

Within the last year several agricultural societies have affiliated with, *i. e.*, have become supporting and subscribing members of the Entomological Society. The names of these affiliated Societies are the Westaskiwin, Lacombe, Red Deer, Innisfail, Olds, Calgary (Inter-Western Pacific), Regina, Moosejaw and Central Saskatchewan. These in return for their financial support and influence have the right to claim addresses from the Entomological Society at their Institute or other meetings. The funds of the Society ($1 membership or affiliation) are supplemented by an annual grant from the Territorial government, and are devoted solely to extending the Society's work. This, then, is some outline of what the Society has already done.

Let us now turn to the next part of our programme:—"How shall we proceed in the future?" I think that the course I have just outlined should be further pursued. Every feature of it, and particularly that of encouraging the younger people, can I believe be extended with benefit to the country. Written or verbal addresses will be given willingly, whenever desired by affiliated agricultural societies. Further prizes will be offered for competition, and these competitions will next year be thrown open to the young folk throughout the Territories.

With regard to the schools, I may say that the teachers (3) in the Lacombe School are actively interested in the work of the Society, and the trustees of that school give every encouragement, and we hope to extend this interest to teachers in certain other schools next year;

and personally I should like every one (teachers and their pupils, farmers and their young folk are especially welcome) to come at any time to my residence, and inspect, under my supervision, the collections of the Society. There, besides many beautiful insects, they will see represented very many of the noxious and beneficial insects from all parts of the States and Canada, and learn the remedies.

More agricultural societies will also be invited next year to support the Entomological Society. This, as Mr. Peterson observes in his letter, is also a step in the right direction, and in accord with the spirit of the law under which the agricultural societies are formed, and with the sentiment of the Department. The distribution of collections of weed seeds will be extended, and a collection of named pressed noxious weeds themselves will gradually be prepared for each affiliated agricultural society. I am endeavoring to form collections of named noxious and beneficial insects for distribution in the same way. I want every insect—no matter how many—sent to me for that purpose every year. The Society will provide the cases and pay all necessary postages. It would be my wish to start a museum of weeds and insects in every school and agricultural society in the Territories if they would only show an active interest in the matter. I have prepared the first of such collections of weeds; this, if the Lacombe Agricultural Society will accept it, will go there and be kept near the collection of seeds, for public reference. A case of insects will also shortly be ready for it, and it will not be my fault if there is not also next year the founding of similar collections at the Lacombe school. Turning our attention now to the insects of 1901, I wish first to thank Mr. T. N. Willings, the Territorial Weed Inspector, and the many other gentlemen who have sent me very valuable accounts of insects noticed by them.

NOTICEABLE INSECTS OF 1901 IN ALBERTA.

Undoubtedly the most conspicuous feature of the year throughout the whole of Central and Northern Alberta from Olds to Edmonton, and east into parts of Saskatchewan, has been the myriads of dragon flies. In the early part of the year we were threatened with an unusual plague of mosquitoes. The flooded sloughs teemed with their larvæ, but very soon after the appearance of the perfect mosquito the dragon flies came on the scene, and during July and August immense numbers filled the country, and in many parts they literally exterminated the mosquito on the wing. Nothing but good has ever been recorded of the dragon fly,—Fig. 57) in fact their mouths are not adapted for eating vegetation, and their larvæ and pupæ live wholly in water, and in both stages are active, their food being larvæ of mosquitos and other soft-bodied aquatic insects

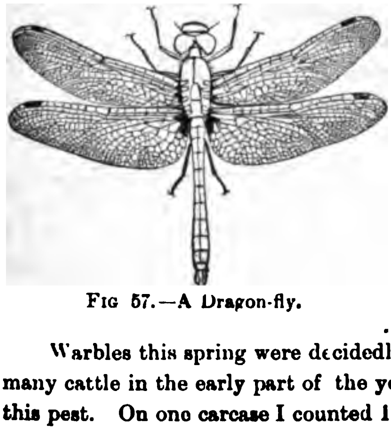

FIG 57.—A Dragon-fly.

Of a different nature, another remarkable occurrence of the season throughout the entire North-West from far south of Calgary, and reported by Mr. T. N. Willing, Mr. F. H. Wolley-Dod, Mr. Clare, of Edmonton, and residents in Prince Albert, Grenfell, Beulah (Man.), and elsewhere, has been the very large numbers of caterpillars of the Painted Lady butterfly (*Pryameis cardui*). The favorite food of these caterpillars is Thistle (including — let us be thankful—the Canadian Thistle), Blue Bur and Pasture Sage. Mr. A. J. Dennis, of Beulah, says that, during four consecutive days in the first week of May, there was a continuous flight of these butterflies in a south-easterly direction, with wind blowing from the south.

Warbles this spring were decidedly more abundant than last year. The deaths of a good many cattle in the early part of the year were, I believe, accelerated, if not directly caused by this pest. On one carcase I counted 175 distinct warbles.

The Horse bot-fly has also been very troublesome.—(Fig. 58.) I might suggest here a simple remedy for this, which was published some time ago by the United States Department of Agriculture, and appeared in one of our agricultural papers. Bruise some Tansy and make an infusion of the juice,—in other words, tansy-tea. Give the horse some of this tea in the morning, and a dose of salts in the evening, and it is said a complete cure will be effected. The process seems like this,—the tea operating to kill the bots clinging to the membrane of the horse's stomach, and the salts expelling the dead bots.

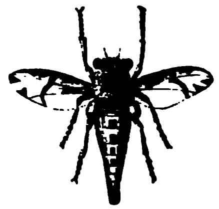

Fig. 58.—Horse Bot-fly. Female.

The Diamond-back moth (*Plutella cruciferarum*) has been again very abundant in all parts of the Territories, seriously damaging many turnip and cabbage crops. The field of riddled and bleached plants was a common spectacle. From the presence last year of parasites in considerable numbers, there were hopes that this pest would not be troublesome this year, but every turnip and cabbage field neglected becomes a simple breeding ground for this insect.

Some cabbage crops about 12 miles east of Lacombe also suffered from the Red turnip-beetle (*Entomoscelis adonidis*). Its appearance is also reported from a few widely separated points in the Territories, but in certain places where it was abundant last year it seems temporarily, at least, to have disappeared.

The Colorado potato-beetle (*Doryphora decemlineata*) is gaining headway. They are reported from Calgary, MacLeod, Pincher Creek, Walsh, Moosejaw and other points. The winters are not fatal to this pest, which passes that season composedly in the pupa state.

Another pest of the potato field more troublesome this year than usual is a wireworm,—chiefly (so far as I have observed) the larva of a "Daddy Long-legs" or Crane fly (*Tipula*). It was a common thing (on taking an average sample) to find 15 per cent. of the potatoes affected by this grub. Reports of its prevalence come from all parts of the Territories.

Damage by root maggots of various kinds has also been conspicuous this year. It is reported from many points, and more particularly from Edmonton and St. Louis (Sask.). Cauliflowers, cabbages and turnips were all about equally the sufferers. Mr. Willing reports the larvæ of a "Cabbage" butterfly (*Pieris protodice*) as having been rather abundant in gardens around Regina, and here and there the little active flea-beetle (*Haltica striolata*) has been destructive to young turnips.

Of foliage trees, Mr. Willing mentions Tent-caterpillars of both species (*Clisiocampa Americana* and *C. disstria*) as having been abundant in Assiniboia, and, for the first time recorded, considerable numbers of the latter species appeared in the Red Deer and Lacombe districts (on aspen poplar). I found a large percentage of these were parasitised by Tachina flies, and I hardly think trouble will be given by this pest for awhile. Aspen poplar also suffered in early spring throughout the entire North-West from the Pallid aspen beetle (*Gonioctena pallida*); and the disagreeable larvæ of the Striped Cottonwood beetle (*Lina scripta*), the pest of osier growers, again attacked willows on river banks, and in Regina box elders suffered from the Box-Elder bug.

Of fruit trees, the black currant in gardens around Regina is reported to have suffered from the "Currant worm."

Cutworms, which must not be confounded with wireworms, from which they are in every way distinct, have not this year given so much trouble. The heavy rains were unfavorable for their development as a pest.

With regard to grain, there have been several complaints of injury to oats when in first blade, the blade wilting away and dying. In two cases which I went to see, the damage was the work of a wireworm of the same genus (*Tipula*) as that affecting potatoes, though a different species. Mr. Willing mentions some talk by farmers of wheat being slightly damaged by an insect, but a report of a more serious nature comes from St. Louis (Sask.), where rye suffered from a stem-midge maggot, which fed within the stem about 1 to 2 feet above ground, and deadened the straw before the heads filled. Several farms, it was stated, bore evidence of the presence of this pest in the rye fields, the heads and straw turning white and dead six weeks before harvest.

A few more words and I will close the list. I made some mention last year of the liability of the arrival of new pests, to which we, in a new country, were always subject. It would seem there are this year two absolutely fresh pests to be reported, both of them beetles. One (*Trirhabda attenuata*) I have found in considerable numbers on raspberry canes (eating the canes bare of leaves), and the other (*Dichelonycha testacea*) on French beans and other garden stuff.

With regard to remedies, as I have taken up so much space already, I will, if the papers will lend me a column, publish in detail, before the winter closes, those which are recommended for each pest.

After the close of the discussion consequent on the address Mr. Howson P. Foulger, of Urquhart, near Lacombe, and Dr. A. E. Jamieson, of Lacombe, were elected members of the Society, and the officers of the Society for 1902 were elected. The officers for 1901 were re-elected, with the exception of Mr. W. Wenman (one of the Council), who has left the country, Mr. Foulger accepting office in his place.

Miss Lucy McL. Howell was then called up and received her prize from the chairman, and the books for prizes Nos. 1 and 2 (Dr. Fletcher's) were selected.

Acknowledgments of several gifts of insects to the Society's collections were then recorded, and the Report of the Council and the Auditor's Report read and the interesting proceedings terminated.

REPORT OF THE COUNCIL.

On behalf of the Council of the North-West (Canada) Entomological Society the President begs respectfully to submit the following report:--

There has been a somewhat drastic remodelling of the Members' Roll. For some two years the Roll has been encumbered with the names of gentlemen who, in the inception of the Society, became admitted as members, but who notwithstanding their membership have done nothing to help it forward. In our articles of constitution there is a clause providing for the automatic removal of such apathetic gentlemen from the Roll in the event of no interest in the Society being evinced by them for a period of eighteen months from enrolment. They cease to be members. These gentlemen occasion needless expense to the Society, and the result of the operation of the above mentioned provision has been that thirty names have been expunged from the Roll. The members helping the Society by cash or kind number thirty-seven. Space will not allow publication of their names, but the President, as the person perhaps most deeply interested in the success of the Society, takes this opportunity to thank each of them, as it were, in person. It would be invidious to single out any individual, as necessarily some have more facilities than others; but all, as the President gratefully believes, support the Society from the purest and most disinterested motives. An institution of this kind is not a commercial concern paying dividends, though as an element of civilization such an institution does, it is conceived, benefit the community as a whole. This, however, the President can safely say, that had it not been for the guidance of his steps by Dr. James Fletcher, Dr. L. O. Howard, Mr. C. W. Peterson, Prof. C. C. James, Mr. H. H. Lyman, and the Rev. Dr. Bethune, and encouragement of other gentlemen, his pathway would have been strewn with boulders.

Additional substantial gifts of Lepidoptera by Messrs. N. B. Sanson, E. F. Heath, and William Wenman, and of Coleoptera by the Rev. Dr. Bethune and Messrs. A. W. Hanham and

Alex. Kwiat (and among the Coleoptera being a series of Parnidæ from Mr. W. D. Richardson), and most generous exchanges by Dr. Strecker, Messrs. W. N. Tallant, Frederick Knab, the Hon. P. C. Truman, and other gentlemen, and a gift by Dr. Fletcher of a series of mosquitoes, have materially augmented the Society's Collections. These gifts are extremely acceptable.

The interest of farmers in the objects of the Society is steadily increasing,—this is evidenced by the affiliation during the past year of additional agricultural societies with our own.

Dr. James Fletcher in the early summer generously offered two prizes for competition by the young folk of Lacombe for the best general collection of insects, and the best of noxious and beneficial insects, the Society adding a third prize for pressed wild plants (including weeds). The Lacombe Field Club furnished the prize winners among several competitors. Rains during the summer interfered somewhat with regular outings of the Club.

PERCY B. GREGSON, President.

November 7th, 1901.

AUDITOR'S REPORT.

Receipts and expenditure of the North-West (Canada) Entomological Society for 1901 :—

RECEIPTS.	$ c.
Members' fees	25 00
Territorial Government Grant	25 00
Deficit (met by President)	10 00
	$60 00

EXPENDITURE.	$ c.
Meetings (farmers, etc.)	14 85
Printing account	3 00
Subscriptions to agricultural, etc., papers	8 50
Stationery	8 00
Cork, pins, etc.	5 40
Apparatus	5 00
Expense account (postages, freights, etc.)	10 25
Sundries (including prize, and distribution of agricultural journals)	5 00
	$60 00

I have examined the books and vouchers of the Treasurer of the North-West (Canada) Entomological Society, and find them correct, and the above is a true statement of its receipts and expenditure for 1901.

(Signed) J. L. TIPPING,
Auditor.

November 8th, 1901.

OBITUARY.

MISS ELEANOR A. ORMEROD, LL.D.

The Science of Entomology in its practical application to agriculture has suffered a great loss through the death of Miss Ormerod, which took place at her residence, Torrington House, St. Albans, England, on Friday, July 19th, 1901. Economic entomologists, not only in England but throughout the world, have been moved with profound regret that a career so remarkable and so useful should have been brought to a close, but one could hardly hope that the aged lady would long be able to sustain the burden of increasing infirmities and the trials of a painful and protracted illness.

Miss Ormerod was born at Sedbury Park, Gloucestershire, on May 11th, 1828, and had thus entered upon her 74th year. She was the youngest of a family of ten, consisting of seven sons and three daughters, of whom she was the last survivor. Her father, Mr. George Ormerod, LL.D., F.R.S., F.S.A., etc., was a distinguished literary man and the author of a notable "History of Cheshire;" her mother was a daughter of Dr. John Latham, F.R.S., at one time President of the Royal College of Physicians. On both sides, therefore, she inherited literary and scientific tastes, and at an early age displayed a love for natural history and out-door pursuits.

One of Miss Ormerod's earliest recollections (as related by Dr. Fream in the "Journal of the Royal Agricultural Society") was being placed in a chair to watch some large water-grubs in a glass, when, to her amazement, one of the creatures which had been injured was devoured by its companions. This youthful observation inspired her with a taste for natural history investigations, and with them she combined a deep interest in botany, horticulture and agricultural chemistry; she also applied herself to the study of Latin, German, French, Italian, Spanish, and other languages. While devoted from her earliest years to objects of out-door life, she was constantly confined to the house by repeated illnesses, but this enforced seclusion only served to render her a more minute, painstaking and exhaustive observer. As her father became advanced in years, it devolved upon her to take a large share in the management of his estates, which included a home farm, and in this way, no doubt, she was led to give the practical turn to her entomological investigations which caused them to be of so much public value afterwards. She also when quite young took an interest, that she continued to maintain throughout her life, in meteorological observations, and in course of time published "The Cobham Journals" of meteorological and phenological records made by Miss Molesworth at Cobham in Surrey. She was the first lady o be admitted as a Fellow of the Royal Meteorological Society, as she was also the first lady to receive (in 1900) the honorary degree of Doctor of Laws at the University of Edinburgh. On the latter occasion Sir Ludovic Grant, the secretary to the Senatus, in presenting Miss Ormerod to the Vice-Chancellor, spoke as follows :—

"Our roll of honorary graduates in law contains the names of many illustrious men, but you will search in vain for the name of a woman. To-day, however, a new roll is to be opened—a roll of illustrious women, and it is matter for congratulation that this roll should begin with a name so honored as that of Miss Ormerod. The pre-eminent position which Miss Ormerod holds in the world of science is the reward of patient study and unwearying observation. Her investigations have been chiefly directed towards the discovery of methods for the prevention of the ravages of those insects which are injurious to orchard, field, and forest. Her labours have been crowned with such success that she is entitled to be hailed as the protectress of agriculture and the fruits of the earth—a beneficent Demeter of the Nineteenth Century. It would take long to enumerate her contributions to entomological and phenological literature, but I may select for mention the valuable series of reports, extending over twenty years, the preparation of which involves correspondence with all parts of the world. Remarkable, too, is the list of the honors which she has received. She was the first lady to be admitted a Fellow of the Royal Meteorological Society, and she has been awarded the silver medal of the Société Nationale d'Acclimatation of France. To these distinctions the University of Edinburgh, sensible of her conspicuous services, and not unmindful of her generous benefactions, now adds its Doctorate in Laws."

A beautiful collection of injurious insects, and an accompaying series of diagrams, the work of Miss Georgiana Ormerod (her elder sister), now the property of the university and in the custody of the Industrial Museum, Edinburgh, were the much appreciated gift of Miss Eleanor Ormerod. An excellent oil painting of herself, also the gift of the generous donor, has been hung in the university court-room, where it occupies a suitable position in the inner circle of those whom the university has delighted to honour.

At Sedbury, where she continued to live until the death of her father in 1873, the farmers and farm labourers keenly appreciated the value of Miss Ormerod's studies when they understood what good results might follow from them, and they not only gave her the benefit of their own observations in the field, but rendered willing aid in tracing noxious insects and collecting examples of the mischief they were doing. By 1868 her attainments in the science of economic Entomology were so well recognized that she was invited to contribute to a collection then begun *by the Royal* Horticultural Society and the Science and Art Department of South Kensington, to illustrate insects useful or prejudical to agriculture. She had previously invented a process of her own for the execution of plaster models, colored by her own hand, of rare garden plants and hot house flowers, and also a method of making electrotype casts of leaves and reptiles, which were remarkably beautiful and artistic. For ten years she was a constant contributor to these collections not only of insects, but also of interesting specimens of grain, roots, timber, etc., exhibiting the nature of the injury done. As an acknowledgement of the value of the assistance she thus afforded, the Royal Horticultural Society presented her with its "Silver Floral Medal."

In 1872 she contributed to the International Polytechnic Exhibition at Moscow a collection of models of insect injuries to plants and electrotypes representing British Natural History. On this occasion also her work was so highly appreciated that she was presented by the University of Moscow with its Silver Medal, its great Silver Medal, and also its Gold Medal of Honour. At a later date she was awarded the Silver Medal of the Société Nationale d' Acclimitation of France in recognition of her services in economic etomology.

In 1877 Miss Ormerod, then in her forty-ninth year, began, with the assistance of her sister. Georgiana, her especial work which caused her to become known throughout the world as the foremost authority in England on practical entomology. She then undertook the preparation of an annual "Report of observations of Injurious Insects and Common Farm Pests" and continued for twenty-four years to issue a volume at her own expense. When she commenced her arduous labours in this connection, very little was known by farmers and gardeners, and not much more by entomologists in Great Britain, of the habits and life histories of insects injurious to farm, garden and orchard crops and to live stock, or of the best means of destroying them or preventing their ravages. What Miss Ormerod did was to collect the observations of a large number of persons in the British Isles, made under her instructions for the most part, to obtain details of any experiments carried out for the destruction of insect pests or the prevention of their attacks, to correspond with workers in other parts of the world who were engaged in similar investigations, to systematise, arrange and publish the information thus obtained, with the addition of her own knowledge and observations of the subject. She also undertook to identify for enquirers any specimens of insects found preying upon their crops and to give prompt advice as to the most likely remedies to adopt. Her correspondence after a few years became immense and the work arduous in the extreme; but she was a woman of boundless energy, full of inspiring enthusiasm, whom nothing could daunt and who shrank from no difficulties or trouble. Her sister Georgiana, her constant companion during these years till her death in 1896, possessed a large measure of artistic talent and was invaluable through her ability in drawing illustrations of insects and their works. She published some years ago a large series of excellent coloured diagrams of injurious insects, which the writer, as well as others, has found most useful for the illustration of lectures on subjects of this kind. Her loss was an irreparable one to her life-long companion and co-worker.

Something of the nature of Miss Ormerod's work, how she appreciated her correspondents, and the modest estimate at which she appraised her own great services to her country, are well stated in her simple and natural way in the preface to her last, the twenty-fourth, Annual Report. When she began the great work of her life in 1877, to quote her own words, "Comparatively little was known of the habits and means of prevention of insects seriously injurious to our crops, and of this little a very small amount was accessible for public service, and I undertook the series of Reports in the hope (so far as in my power lay) of doing something to meet both these difficulties." How fully her hope was realized is shewn by her further statement, "Now the *necessities* of the case have been gradually changing. Year after year information has been sent, gradually completing *most* of the histories of *most* of our worst insect pests, and now additional information is rarely on points of great agricultural importance." In other words she has succeeded, by dint of long continued and hard work, in making fully-known the life histories of all the most serious pests in the British Isles, and in prescribing the best available methods of dealing with them. No such work can ever be finished or ever be perfect, but Miss Ormerod has done the task of a pioneer; she has cleared away the obstructions of ignorance and has laid solidly and well the foundations of a knowledge that requires now only to be kept up and added to as time goes on and changes naturally occur. A further quotation reveals the nature of her work and her recognition of the services of others:

"But the work was hard; for many years for about five or six months all the time I could give to the subject was devoted to arranging the contributions of the season for the annual report of the year, with additions of the best information I could procure from other sources (in every case, whether of contributors or otherwise, fully acknowledged).... I claim no credit to myself in the work; but those who will look over the names of the contributors given with their information will see how deeply indebted I am to them, and to other good friends, who have placed their experience and great knowledge at the public service. To them, and to all who have assisted me, and to some who have allowed what began as agricultural communication to ripen into valuable friendship, I offer my grateful thanks and my deep appreciation of their goodness, and I trust they will believe that if, as I well know, much of my work has not been as well done as it would have been in better qualified hands, at least I have earnestly tried to do my very best."

Miss Ormerod's investigations were not confined to insects affecting vegetation and farm products, but included those attacking live stock also. One of her most useful works was her campaign against the Ox Warble-fly, which she conducted with her accustomed energy and enthusiasm until the great suffering to animals, the heavy losses to their owners and the serious damage to hides which it caused became known far and wide. As a result of her work cattle-owners in all parts of the world now know the best course to pursue to rid their cattle of the maggots of the insect, or better still, to prevent the insertion of the eggs that produce them. Corresponding enemies of the horse, the deer and the sheep were also investigated by her, and the results published in the annual reports.

In addition to the four and twenty volumes of Reports, Miss Ormerod published a number of other works on Entomological subjects; among these may be mentioned the "Manual of Injurious Insects," 1881; "Guide to Methods of Insect Life," 1884; "Injurious Insects of South Africa," 1889; "A Text-book of Agricultural Entomology"; "Observations on Warble Fly"; "A Hand-book of Insects injurious to Orchard and Bush Fruits"; and a number of pamphlets on such subjects as the Hessian Fly, the use of Paris Green, the Turnip Fly, Root attacks on Turnips and Cabbage, etc.

Besides the distinctions already referred to Miss Ormerod was an honorary or corresponding member of a large number of Scientific Societies in Europe, America, Australia and South Africa, Fellow of the Entomological Societies of London and Stockholm, Honorary Entomologist to the Royal Agricultural Society and subsequently Examiner in Agricultural Entomology in the University of Edinburgh. For many years past she was an honorary member of, and took much interest in, our Entomological Society of Ontario.

Miss Ormerod was indeed one of the most remarkable women of the latter half of the nineteenth century, and did more than anyone else in the British Isles to further the interests of farmers, fruit-growers, and gardeners by making known to them practicable methods for controlling and subduing their multiform insect pests. Her labours were unwearied and unselfish; she received no remuneration for her services, but cheerfully expended her own means in carrying out her investigations and publishing their results. In private life she was kindly and hospitable; with an old-fashioned courtesy, and the manners and ideas of by-gone days, she and her sister possessed a charm all their own, and the writer recalls with pleasant memories his visit to their home at Isleworth. By whom in England her work can be contined we do not know; it is not likely that anyone can follow in the unique path laid out by Miss Ormerod. We may therefore, cherish the hope that the Government of the day will hold out a helping hand and, establish an Entomological Bureau for the lasting benefit of the great agricultural interests of the country.

C. J. S. B.

OTTO LUGGER.

The ranks of American economic entomologists have suffered a serious loss through the death of Otto Lugger, State Entomologist of Minnesota. He died on the 21st of May, 1901, from pneumonia, after a very short illness, in the 57th year of his age. From Dr. L. O. Howard's obituary notice in *Science* the following particulars have been gathered. Mr. Lugger was born at Hagen, Westphalia, his father being a professor of chemistry in a Prussian university. In 1865 he came with his parents to the United States, and obtained a position in the Engineer Corps of the Army; he was engaged for two years in a survey of the Great Lakes. He had always been interested in entomology, and collected specimens during his engineering work. Becoming acquainted with Dr. C. V. Riley at Chicago, he went with him to St. Louis as assistant on his appointment to be State Entomologist of Missouri in 1868. For eight years he continued to be Dr. Riley's "quiet, unassuming, self-sacrificing and devoted helper." At the end of this period he married and removed to Baltimore, where he became the Curator of the Maryland Academy of Science and naturalist of the city parks. Ten years later, in 1885, he was appointed assistant in the Division of Entomology of the U. S. Department of Agriculture and remained in Washington for three years; he then became Entomologist to the State Agricultural Experimental Station of Minnesota and continued to hold this position till his death a few months ago.

"His first entomological experience in the State of Minnesota was one of great interest and importance, and his vigorous and intelligent action in the face of a great emergency fixed his standing as a most useful officer firmly in the minds of the Minnesota farmers. An enormous swarm of the Rocky Mountain locust, or western migratory grasshopper, had settled down in Ottertail County. By Lugger's advice and energetic field work, backed as he was by a public spirited and intelligent Governor (Hon. W. R. Merriam, now director of the U. S. Census), who personally guaranteed the funds necessary for the campaign, the hordes of destructive insects were annihilated and great damage was averted."

From that time on, for nearly 13 years, he continued his active work, issued frequent publications, and gained the profound respect of his constituents and of the scientific men of the country. His more important works were a series of profusely illustrated papers on the different orders of insects found in the State; the parts he was enabled to publish were on the Parasites of Man and Domestic Animals, the Orthoptera, Lepidoptera, Coleoptera, and Hemiptera of Minnesota. At the time of his death he was preparing the parts on Diptera and Neuroptera, which, it is hoped, may have been left sufficiently advanced for publication. The series, if he had lived to complete it, would have formed an admirable manual of Entomology for the Western States, and of use to naturalists everywhere; they were written in a clear and interesting manner, and prepared with great care and accuracy. He was also a good botanist, and published several useful papers on plant diseases.

In 1899 Mr. Lugger, accompanied Dr. Fletcher in an investigation of the areas in southern Manitoba which were infested by the Rocky Mountain Locust during the preceding year, and aided him in the discovery of eggs and freshly emerged young locusts near Deloraine. He also joined with Dr. Fletcher in addressing a number of meetings of farmers in different parts of the province.

He is described by Dr. Howard as "a man of admirable qualities; his wide information, his agreeable personality, and his keen sense of humour, made him a most delightful companion. Many of his stories and humorous sayings are current among entomologists all over the United States, and his loss will be felt for many years to come."

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THIRTY-THIRD ANNUAL REPORT

OF THE

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OF

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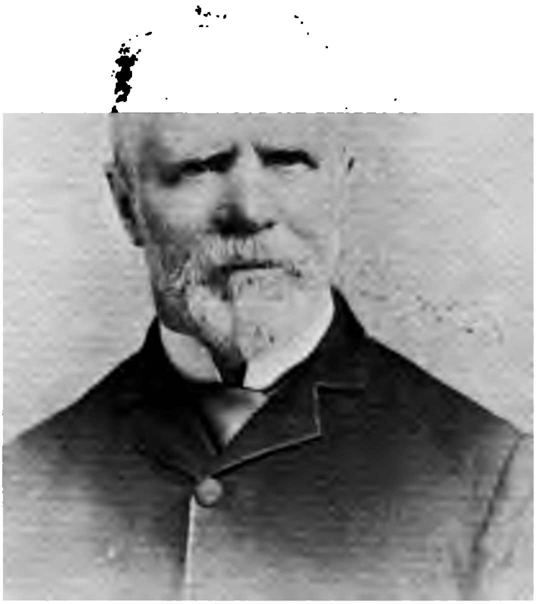
WILLIAM E. SAUNDERS,
Secretary of the Entomological Society of Ontario from 1887.



E Baynes Reed

Edmund Baynes Reed,
An original member of the Entomological Society of Ontario.

THIRTY-THIRD ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1902.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to present herewith the Thirty-Third Annual Report of the Entomological Society of Ontario.

The Thirty-Ninth Annual Meeting was held in London, on Wednesday and Thursday, October 29th and 30th, 1902. A full account of the proceedings, with the papers read and reports submitted, is given in the following pages. An interesting and important feature of the meeting was a conference on the Pea-Weevil, its injuries to the crop in Ontario and the best means of reducing its ravages.

The *Canadian Entomologist*, the monthly organ of the society, has been regularly issued during the past year, and has now completed its thirty-fourth volume. It continues to maintain its reputation as a scientific magazine of high character.

I have the honor to be, Sir,

Your obedient Servant,

CHARLES J. S. BETHUNE,

Editor.

LONDON, ONTARIO.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-ninth annual meeting of the Entomological Society of Ontario was held in London on Wednesday and Thursday, the 29th and 30th, of October, 1902. The chair was taken by the Rev. Dr. Fyles, of South Quebec, President. Among the members present were Mr. Henry H. Lyman, Montreal; Dr. James Fletcher and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. Charles H. Young, Hurdman's Bridge, Ont.; Mr. John D. Evans, Trenton; Mr. George E. Fisher, Inspector of Scale Insects, Freeman; Prof. W. Lochhead, Ontario Agricultural College, Guelph; Rev. Dr. Bethune, Dr. Woolverton, Dr. Stevenson, Messrs. J. A. Balkwill, J. H. Bowman, E. A. Browne, J. Dearness, C. J. Fox, C. W. Horton, John Law, J. Alston Moffat, W. E. Saunders, Walter Smith, and other residents of London. The Society was also favoured with the presence of Prof. C. C. James, Deputy Minister of Agriculture for Ontario; Mr. W. L. Smith of the Toronto *Weekly Sun*; Messrs. Thompson and Black of the *Farmers' Advocate*; Mr. Pearce, and other visitors.

Letters expressing regret at their inability to attend were received from Mr. W. Hague Harrington, Ottawa and Mr. E. M. Walker, Director, Toronto; also from Prof. F. M. Webster, Urbana, Illinois.

During the morning of Wednesday, Oct. 29th, a meeting of the Council was held for the transaction of the business of the Society and the preparation of their annual report. It was decided to hold the next annual meeting of the Society in Ottawa in September, 1903. Sheet Cork and Entomological pins were ordered to be sold to members at cost and to others at twenty per cent. advance on cost, and arrangements were made for obtaining a supply of black enamelled steel pins. A resolution was adopted permitting the Ornithological Section to alter its name to "The McIlwraith Ornithological Club (Ornithological Section of the Entomological Society of Ontario)."

In the afternoon the Society met at 2.30 o'clock, the President, Rev. Dr. Fyles, in the chair, and proceeded to discuss the prevalence of the Pea Weevil in Ontario and the best means of controlling its ravages.

THE PEA WEEVIL CONFERENCE.

At the request of the President, Dr. Fletcher, of Ottawa, introduced the subject of the Pea Weevil. The following is a condensed summary of his remarks:

Dr. FLETCHER: Mr. President and Gentlemen. Everyone must have noticed for many years the great reduction which has been gradually taking place in the area of land devoted to the cultivation of Peas. This I find has been almost entirely due to the fact that farmers find that pea growing is not a remunerative occupation, owing to the diminution both in output and the value of the grain due to the attacks of the Pea Weevil. In my own Reports, which reach a considerable number of farmers in the Dominion, I have constantly drawn attention to this injury and the simple means of controlling the insect which causes it, but the loss at the present time is so serious and the pea crop is one of such enormous importance that I feel something more definite than has been done in the past should be done to bring this subject prominently before the country, so as if possible to stir up the pea-growers and seed-dealers throughout the Dominion and in the adjacent United States where peas are grown to join in one great, universal, and co-operative effort. The pea crop is of special value to farmers because nothing quite takes the place of peas as feed for pigs. This has a direct bearing, not only upon the pork and bacon trade of the country both for home use and export, but also upon the closely associated industry of dairying. Moreover, it seems to me that the problem now before the country is an exceptionally simple one, and Prof. Lochhead and I have been considering what can be done to change the existing state of affairs. Naturally, in such an important matter we have the keenest sympathy of both the Honourable Sydney Fisher and the Honourable John Dryden, who are most anxious to find out what can be done to protect this important crop. It is for this reason that the Council of the Entomological Society of Ontario have thought it wise to arrange for to-day's conference, so that some steps may be at once taken to arouse interest and also that more energetic measures may be adopted than have been in the past.

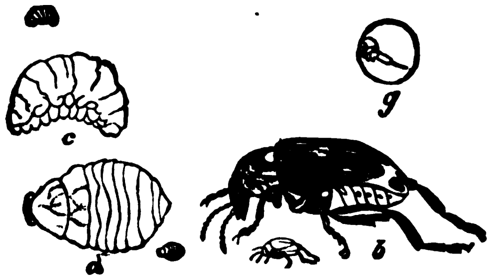

Fig. 1.—The Pea Weevil.

The greatest enemy of the pea crop is the Pea Weevil, *Bruchus pisorum*, (Fig. 1), more generally known in trade as the Pea Bug. This insect has been established in Canada as a pest of the pea for a great many years but during the last ten years it has become such a serious enemy that in many of our Ontario districts where peas could be grown some years ago of the very highest quality—of such a high quality indeed that Canadian peas were considered the best that could be produced in all the markets of the world,—farmers have now given up the cultivation of peas altogether, and in many other districts they are now talking of doing the same. Personally, I do not believe that it is necessary to give up the cultivation of peas nor that it would be a wise thing to do so. The crop as I have stated above is one of exceptional value, and I cannot see how this step would be of very much benefit in controlling the insect. It has been suggested—and I may mention that this seems to be the favourite remedy proposed by most people who have written to me,—to stop growing peas for one or two years, and to pass some law by which everyone is prevented from sowing. I do not believe that, if any such legislation were passed, it could possibly be enforced ; for, to be effective, the cultivation of peas would have to be stopped absolutely in every pea field and private garden, both in Canada and the United States. I am quite certain that many would not regard this law and would insist on growing a few green peas for table use, and although every wise gardener who knows how to make the best use of his ground pulls up his vines as soon as his crop of green peas is picked and uses his land for something else, the people who would sow peas in opposition to the law, belong to the class of gardeners who leave their pea vines standing in the garden all through the summer, and upon these a sufficient number of small pods containing weevils would be left to ripen, to destroy the effects of the whole experiment. Many people would openly defy this law and claim that it was absurd, nor would this be much to be wondered at when we see how little informed most of the dealers and pea growers are with regard to the Pea Weevil and the extremely simple means by which this pest can be reduced. Although it is true that many of the large seed merchants have fumigating houses for the treatment of infested peas, many of them, I know as an actual fact, do not use them regularly and one of our large Canadian seed houses even wrote to me that as long as everybody was not forced to fumigate their peas they did not intend to do so, that it was an extra expense and caused trouble with the insurance companies. I believe that instead of legislation the proper course to adopt at the present time, is to provide accurate information with regard to the life history of the insect, the best remedies and the best way to apply them ; then, to distribute this so freely all over the country that everyone interested may at any rate be reminded at the proper time what steps should be taken, and, not only this, but every other citizen of Canada, whether he knows that he is interested or not, should be made to wonder what all the agitation was about.

If all seed merchants would, for their own sakes, give the recognized remedy of fumigating peas with bisulphide of carbon a trial, and sell no peas for seed which they were not certain had been fumigated, and if all growers of peas would refuse and send back to their seed merchants every sample of peas containing living weevils, I feel sure that evident results would be seen in a single year. The problem is extremely simple, but it requires perfect co-operation. There are, of course, difficulties to be met, but I cannot yet find any of these which cannot be overcome. The amount at stake every year which runs into millions of dollars at any rate, makes it worth while for every member of this Society and for everyone connected officially with any agricultural institution, to make a great effort. The state of public opinion at the present moment seems to point out that this is an opportune time to make this effort. In many districts farmers have already practically given up growing peas. There are also indications that, owing probably to the damp cool season of 1902, a larger proportion than usual of the Weevils are passing this winter inside the seed peas and, consequently, could be easily destroyed by fumigating. The magnitude of the loss is now generally recognized, and farmers throughout the country are in a state of nervous anxiety and ready to listen to and act upon any suggestions which commend themselves to their common sense.

The life-history of the Pea Weevil is briefly as follows: The eggs are laid on the young forming pods by the beetles which have wintered over either in the seed peas or about buildings. As soon as the eggs hatch, the grubs eat their way through the forming pod and attack the pea which is nearest to them. They penetrate this, and soon by the increase in the size of the pea every trace of the hole is obliterated. The grub remains inside the pea until full grown, changing to a pupa in July and attaining the fully-developed condition of a beetle before the middle of August. According to the season, a larger or smaller number of the beetles leave the peas in the autumn and pass the winter under heaps of rubbish, or secreted about buildings. I think the normal way for this insect to pass the winter is inside the seed peas. The important points to remember in this discussion and which induced me to say that the problem before us is a simple one, are the following: The Pea Weevil is not a native insect, and therefore has not an extensive range of food plants, in which it could live outside the cultivated pea. That plant, which is an exotic, is the only known food plant of the Pea Weevil and occurs nowhere in this country wild or even in a spontaneous manner. All plants which spring up in the field from accidentally dropped seeds are destroyed by our winters, therefore every seed sown for a crop of peas has at some time been in the hands of the grower or seed merchant, where it could have been treated by the well known remedy of fumigating with bisulphide of carbon, which for this insect is a perfectly practical remedy, and by a practical remedy I mean a remedy which is effectual, is simple so that it can be applied without any danger of error, and is cheap enough to make its application a paying operation. It is claimed by some that the chief difficulty in the way of trusting to fumigation as a main remedy for controlling the Pea Weevil is that a sufficient number of peas are shelled out in the field at harvest time to leave insects enough to emerge and infest the following crop, even if all the seeds were treated. To obviate this difficulty, I have recommended a plan which some have adopted to reap their crop as early as possible, as much on the green side as can be done with safety. It is a well known fact that seeds of all kinds reaped on the green side rather than when they are over-ripe, have a higher germinating power. It is certain that they would shell out in the field less, and, if such seed were fumigated at once, the weevils would be destroyed inside them before they had made a very serious diminution in the bulk of the seed. If there should be difficulties in the way of farmers themselves treating their seed at once, which however they are quite easily able to do, they should without delay sell to the grain buyers, who knowing the advantage of fumigating early would soon make arrangements, even if they had not these already, to treat the seed so as to get the best sample possible. With regard to those peas which shell out in the field, I cannot see any very great difficulty with these. It is the common practice in the pea growing districts for farmers to turn in hogs after the crop is harvested. These pick up every seed cleanly, and with the assistance of poultry I imagine that few infested peas would be left on the field to carry over the infestation. If thought preferable, these peas could be turned down below the point where the weevils would be able to reach the surface after emerging, by ploughing down the land deeply either in autumn, and of course preferably then, or in spring.

I have here some samples of peas which have been treated at various dates from the end of July until the middle of September. These have been kindly supplied by Mr. W. P. Niles, of Wellington, Ont., a well known seed merchant who deals largely in peas. By examining those fumigated on the 31st July, it is evident that the weevil is at that time very small and that the proportion of the pea which has been destroyed, is much smaller than it is when the peas have been treated only one week later, the grub being at that time not even half grown and only a small amount of the seed being destroyed. From that date on the destruction to the seed is rapid and by the middle of the month of August most of the peas contain full grown larvæ or pupæ. I have here samples of peas grown this year and treated on the 28th August, which contain the fully developed beetles, and it is probable that by the middle of the month in an ordinary year perfect beetles may be found. My recommendation therefore is that farmers should reap early, thresh at once, treat their seed, or sell to others who will, before the middle of August, and never sow a single seed which has not first been fumigated. Talk the matter up whenever an opportunity arises and guard against pooh-poohing the whole matter and saying: "Oh we know all about the Pea Weevil, that's the same as the Pea Bug;" we have always had that, and thereby arguing by inference that they always will have it.

Now I don't believe that there is any necessity for such a valuable Canadian crop as peas, either to be given up or to be infested by the Pea Weevil. I find from the August 1902 Ontario Crop Bulletin that the acreage this year under peas has been reduced from the area sown last year by 70,000 acres, and the yield by 1,274,000 bushels. This is undoubtedly a very serious loss, because certain districts of Ontario are particularly well suited for the production of this cereal. There is evidence to show that many of these districts specially suited to the cultivation of the pea crop, and where peas of the highest quality used to be grown, cannot now produce paying crops of peas owing to the depredations of the Pea Weevil. There are, however, many districts, as for instance the upper Ottawa country and other northern districts, where paying crops of peas are being or could be grown, and the passing of legislation forbidding the cultivation of peas over the whole province would therefore be a hardship. There is another point which may be referred to. It is frequently claimed by dealers that peas which have been injured by the pea weevil are just as good for seed as perfect seeds. This is manifestly nonsense, but, to be in a position to prove this, I have in several seasons experimented by sowing infested seed and taking careful notes on how many plants grew and what was the vigour of these plants. During the past season I planted several rows of early peas which had been bored by Pea Weevils. The average number of these seeds which grew and produced seed bearing plants was 7. and of these some were weakly. This is rather a lower average than has been obtained in previous years, but it was what the season of 1902 showed. It has been found by many experiments made by botanists at Washington and at Agricultural Colleges that large seeds of plants, as a rule, produce more vigorous plants than small seeds. Much more would this be the case where nature had laid up in a seed a certain amount of food to feed the embryo plantlet in that seed, and subsequently a large proportion even to one-fourth of its bulk was accidentally taken away, as in the case of peas injured by the weevil. In the many cases where the germ is destroyed by the weevil, of course no growth takes place at all.

This question of controlling the Pea Weevil in Canada is one which concerns everybody. It is not with the large seed merchants and big houses with which most danger lies but with the individual farmer and private individual who grow a few seed peas for their own use and do nothing to destroy the weevils in them before sowing. As I have stated, there are easy remedies which are available for all, such as holding over the seed till the second year, or treat- it with coal oil, using one gallon to 20 bushels ; but the best remedy consists in fumigating with bisulphide of carbon, and a farmer who has only five bushels of seed can fumigate this at the expense of a few cents by putting the five bushels in an ordinary coal oil barrel and then placing (either in an open dish on the top or by pouring the liquid straight upon the seed) one ounce of bisulphide for every hundred pounds of seed. A bushel of peas weighs about 60 lbs, therefore the five bushels would require three ounces. The barrel must be closed up tightly and left in an open shed away from other buildings for 48 hours. The bisulphide is a liquid with a very objectionable odour which vaporizes quickly at the ordinary temperature of the atmosphere. The vapour is heavy and quickly runs down through the peas, and, as it is exceedingly deadly to all forms of animal life, every insect in the peas will be killed. The unpleasant odour of the chemical is very soon dissipated when the peas are exposed to the air, and the value of this treatment is that not only are the infesting insects destroyed with certainty but this without injury to the seeds either as to their wholesomeness for food or as to their germinating quality for seed. If it is thought that there is any danger in using such an inflammable material as bisulphide of carbon or there is any hesitancy, as is sometimes the case in using a remedy with which farmers are not familiar, there is always at any rate available the old and well tried remedy of holding over the seed for two years, by bagging the peas immediately after threshing. If this is done with early harvested and threshed peas, not a single weevil can escape, for it has been proved that these cannot eat their way out from a bag of cotton, or even of paper, and all weevils which issue in the bags must die. A very rare instance is on record of a weevil living over in the seed until the second year, but this is such a rare exception that it need not be considered and does not amount to a proportion of one in many hundreds of millions ; indeed is so rare that I do not know of a single instance where it has been authoritatively confirmed.

One of the largest seedsmen in Canada tells me that he has to send to Germany to get his peas grown. And we have competition to-day in the London market. Indian peas shipped from Calcutta are being sold at a few cents cheaper than we can get them to the London market, and they are as good as our best peas ; therefore, our trade is in danger, and it is important that we should wake up at once and save this crop, which I believe can be saved if we will only go about it in the proper way.

Every letter I have received and every seedsman I have consulted, have agreed that public attention should be drawn to this matter. I have correspondents in all parts of the country, and all say it is a most important matter and requires immediate attention. There is no Society that can draw attention to it better than the Entomological Society. The seedsmen I have consulted, are of the opinion that, if the suggestions given above were adopted, a large reduction could be made in a very short time in the increase of this insect.

The acreage of peas is now reduced very low. It will not be increased very much next year, so that we have an opportunity to start now to draw public attention to this matter. Professor Lochhead and I have been corresponding about the subject for a year, and there is no doubt about it that the Federal and Provincial Governments will do all they can to draw public attention to the matter and to help in every possible way to get rid of this pest.

The Grass Pea, which has been suggested as a substitute for the field pea, has not proved as great a success as was hoped. It is not a pea, though it is considered a pea for many purposes, but it belongs to the Genus *Lathyrus*. The pea is a *Pisum*. *Lathyrus* is another plant altogether, and that is the reason probably why the Grass Pea is free from the attacks of the Pea Weevil. It is a very late maturing pea, and I am sorry to say that those who planted it this year, owing to the late season, were disappointed in its growth, because it is a plant which comes from India; for that reason this damp moist season did not mature it, and it was not a paying crop. Vines which bore ripe peas in September, had as much of the vine covered with green leaves and flowers, as there was with the ripe peas. In the St. Catharines and Niagara Districts it has been grown to some extent. Most of the seedsmen are not in favor of the Grass Pea. I would not say, "Do not grow it," because, where the Pea Weevil prevents the growth of the proper peas, the Grass Pea forms a substitute which is comparatively valuable. There are difficulties in harvesting it, and the seeds are thought to be very hard, therefore, some farmers do not like it, but that can be overcome by crushing them with machinery.

I shall not take any more time now, but I shall be very much obliged if any one else would give us their ideas, either on what I have said or upon matters which I have left unmentioned. I have letters here from some of the leading seedsmen in Canada, saying they would have liked to be at this meeting, if they could have made arrangments. I am pleased that Professor James is here with us, and that Mr. Smith is here from Toronto, for the *Weekly Sun*, and Mr. Black from the *Farmers' Advocate*.

Prof. **Lochhead**: Mr. President. The Pea Weevil is one of the greatest enemies of the farmer of Ontario to day. Before coming here I secured from Professor James the difference in the amount of seed grown in the year 1891 and 1902. The crop in Ontario in 1891 was eighteen and one half million bushels; in 1902 eleven and one half million bushels. That shows a decrease of seven million bushels in ten years; that itself is sufficient to direct serious attention to the subject.

Dr. **Fletcher**: What is the average value of a bushel of peas, Mr. Pearce?

Mr. **Pearce**: It is now about 60c. for field peas.

Dr. **Fletcher**: I average it from 70c. to $1.00 taking the common peas and the high class.

Mr. **Pearce**: That would be about right for the high class.

Dr. **Fletcher**: It is a loss, at any rate, of between $5,000,000 and $7,000,000.

Prof. **Lochhead**: The pest is known in the northern counties and all along the shore of Lake Ontario. This summer I visited North Grey, and I found that the farmers in that district were seriously disturbed over an enemy that was new to them—so new that they did not know what it was. This was the Pea Weevil. I was travelling through the County on Farmers' Institute work and I gave two lectures a day on the Pea Weevil. This summer I had the pleasure of going up through Manitoulin Island and as far as St. Joseph's Island; no Pea Weevil exists there, and we saw beautiful crops. I have no doubt that Manitoulin Island is well adapted for pea growing, and I told the people up there that they had a great opportunity of making their island as famous for seed peas as the Jersey people had made theirs for Jersey cattle. If they would keep the Pea Weevil out, they might make it a reserve for growing pea seed. On St. Joseph's Island I found a good illustration of the fact that the Pea Weevil does not exist there. I spent one morning going through pea fields. One farmer told me he had imported some seeds and when they came the bag was literally alive with the Pea Weevil; however, he sowed the peas but took the precaution to sow about five times the normal amount per acre, and he had a good field of peas, I could not find a single weevil in the whole morning's examination of the growing crop. It showed conclusively that this year, at any rate, the pea weevil does not thrive in St. Joseph's Island.

With regard to the point which Dr. Fletcher emphasized very strongly, that the pea-weevil does not reach its full size when the pea is harvested. I was unable to make an examination to any great extent, but I asked several farmers who were interested in the Pea Weevil to make an examination. Probably some of you know Mr. Lick of Oshawa, an up-to-date farmer. I asked him what in his opinion was the best time to treat peas and he said that in order to answer this question it is necessary to ascertain at what stage the crop was harvested; he found that not more than one-half the damage was done until after the crop was harvested, and in many cases not more than a third of the damage was done before the pea reached maturity; this was true of both the early and late varieties. He found a large percentage of the early crop was "buggy," and these were his conclusions: "Don't sow 'buggy' peas without treating the weevil. Harvest the crops as soon as ripe and thresh at once; for seed peas fumigate at once; if for feed, grind the peas up and so kill the weevil."

With regard to the number of weevils that germinate, Dr. Fletcher has given you his results, and you will also find them in his Reports. Mr. Zavitz, of the Ontario Agricultural College, also made experiments some years ago, and found in the case of the large variety of pea such as the Marrowfat, that three-fifths of the peas that had been entered by the weevil did not germinate. In the case of the small variety of peas such as the Golden Vine, he found only 13 per cent germinated.

I do not see any other way of treating the Pea Weevil except the method Dr. Fletcher has described; I should like, however, to suggest another way by which we may reach the people. There is nothing like an object lesson. While we may do our best through the agricultural papers and reports of all kinds experience has shown that a great many people will not act; they simply say they will not be bothered, and will grow enough peas for themselves, and not care whether they sell any or not. These are the kind of people we want to influence, as well as the larger growers. We do not know just exactly how far the Pea Weevil will fly; I do not think they will fly much farther than from one farm to another. Mr. Pearce tells me that down in Elgin, in two sections that were separated by a woods, the Pea Weevils were in one section for many years but did not appear in the other section until they got in through the sowing of weevily seed; I am of the opinion that the chief way in which the insect is disseminated is by sowing weevily peas. I would suggest that help be obtained from the Government for a series of experiments. First secure a good man to act as foreman or manager of the whole experiment and let him appoint a corps of assistants. These men he could train himself, and they should be able to fumigate properly, and then I should choose a section of country of two or three townships, and have these sections scattered in different parts of the Province so as to form as many object lessons as possible, a concession or two concessions might be allotted to each man. Every farmer should be interested in the matter and got to provide a pen, or coal-oil barrel, or box, in which to fumigate, the government might provide the material. I would have these men go systematically down the concession at harvest time and see that the peas are threshed immediately, and then fumigate them for the farmers. It might probably be necessary to fumigate twice. The men would not need to stay very long in one place. If the farmer had already prepared the pens, he could fumigate in an hour, and then go on to the next farm, and return and ventilate them after forty-eight hours. I think one man could in that way arrange for the fumigation of three or four concessions, and a couple of men could do a township.

A great many people do not believe in the entire efficiency of this remedy, and if we can get to their farms, and kill all the weevils, we shall soon convince them of its efficiency. This is a simple suggestion and I should like the members to discuss the matter.

Mr. Fisher: We live in Burlington and we formerly grew peas but of late years we have abandoned them altogether. I have always held that the appearance and the disappearance of the Pea Weevil coincided with the change of temperature. If we had a very low temperature during the winter the Pea Weevils were destroyed.

Dr. Fletcher: What is your idea about the Grass Pea taking the place of the peas?

Mr. Fisher: We grow the Grass Pea somewhat extensively. It is not infested with the bug, and we can grow it without the weevil; I do not know any reason why it should not be grown. I would very much rather have the ordinary pea because the Grass Pea is a very difficult thing to cut. The vine is hard and wiry and dulls the tools that you use in cutting it, very quickly.

Dr. Fletcher: How does it ripen?

Mr. Fisher: I do not think there is very much trouble about their ripening. We sow them about the time we sow the other peas. My experience in growing peas has been that the early-sown peas are altogether the best. I sowed a large field once in a snow storm and had a very superior crop. What is your opinion as to a cold winter killing the Pea Weevil?

Dr. Fletcher: It is supposed that it does to a large extent affect them and that is the reason that the area of destruction has been so limited in Canada. I do not think it will kill them sufficiently to consider it a remedy.

Prof. Lochhead: I tried an experiment some years ago. I exposed some of the weevily peas to a temperature of 20 below zero, and in every case the weevil was killed.

Dr. Fletcher: It was not so with us, at 15 degrees below zero we exposed them in a glass bottle, and thought they were all dead, but in half an hour afterwards they became lively again.

Mr. Fisher: At what time do they mature?

Dr. Fletcher: If the peas are left in the field too long, there are enough shelled out to carry the weevil over. The weevil matures about the middle of August. Peas fumigated by Mr. Niles of Wellington on the 5th of August had the weevil about half grown. In very early seasons the Pea Weevil has been found during the first half of August. That is a very rare thing. On the 5th of August this year the weevil was only half grown; on the 15th of August it was more than half grown, and by the end of August the weevil was in a perfect state. Peas left in the field are certainly a great source of danger; they should receive special attention either by feeding them off or ploughing them down deeply.

Dr. Fyles: Do you suppose that the weevil leaves the pea on approach of winter?

Dr. Fletcher: They may do so. A considerable number of them leave the peas in the autumn, and they hibernate around the barn or in the rubbish heaps, and a great many of them are killed during the winter.

Mr. Fisher: It is the practice of some fruit growers to work their orchards up to the middle of July, and then sow peas, and they usually get a crop. Where I live the peas will ripen if sown in the middle of July; the peas will also gather nitrogen and increase the fertility of the soil to a considerable extent. We also keep hogs there and if we turn a hundred hogs on twenty acres of peas in the middle of July, we find that the hogs do very well in cleaning up the pea crop and the apples that fall. They serve the double purpose of freeing the orchard from pests that infest the fruit, and of making pork.

Dr. Fletcher: That is an excellent practice. There is no doubt that these peas would be practically free from weevil attack when sown so late, but the crop would be reduced by mildew. I should like to ask Mr. Pearce if it is not a general practice here to sow as early as possible; because if sown late they will be affected with mildew.

Mr. Pearce: Yes, that is the experience with farmers in this section; late sown peas are subject to mildew, but they are freer from the weevil. A good many of the farmers here sow them on the 24th of May, but the earlier they are sown the better,—the better the sample you get, and the better the yield.

Prof. James, being asked to say a few words on the subject, said: I certainly cannot add anything to what Prof. Lochhead and Dr. Fletcher have told us as to the nature of the trouble, but I can emphasize what they have said regarding its extent. I think the evil of the Pea Weevil is co-extensive with the crop. I do not mean that it is co-extensive with the possibilities of the crop, yet there are very few sections where the pea is grown where you do not find the weevil. There are sections where the pea can be grown where you probably will not find the weevil for some time. We have been told about Manitoulin and St. Joseph Islands. Their contributions of peas to our general crops are very small, and I think at least ninety per cent. of the peas that are grown to-day are grown in weevil-affected sections. When you get to the remote sections, where peas play an unimportant part, you do not find any weevil, and I may say the finest peas I have seen in this Province came from the Temiskaming section They were beautiful, perfectly grown peas, and there is no doubt we have, away in the east and up the Ottawa valley, sections where peas can be grown extensively for a time. The trouble is that where the great bulk of our peas are grown we have the weevil to an enormous extent, and if we give up growing peas because the weevil is here, it would mean that we have been beaten. We have never yet been brought to that position, and if we give up the fight of the weevil, we might as well retire practically from Agriculture in this Province. The weevil can be kept in check, and the whole question now is, how are we going to convince the farmers that they ought to help us in checking this evil. This is the problem that is before us, not only in connection with the Pea Weevil, but in connection with very many other things ; to try and prove to the farmers, and a great many others in the Province, that they ought to do certain things in their own interest. On the face of it, it appears to be a very easy matter to say to the farmer, here is a way you can get good seed peas, and then to expect them all to drop into line and do it at once. But that is the greatest difficulty we have to contend with. There is very little use passing a law, that they must do so and so, because you cannot enforce a law unless you have public opinion at the back of it. Something must be done, and something is going to be done, and I hope we shall get here to-day some practical suggestions that will help us to solve this problem. It is certain that both the departments at Ottawa and Toronto will spend what money is necessary to fight this evil, if we can only see some possibility of success ahead.

The pea crop is a unique crop in the Province of Ontario. It is one that we cannot dispense with. It cannot be measured by the number of bushels we produce, because along with it is another great industry, that is the pork and bacon business, which to a great extent depends upon the pea crop ; for to the pea crop and to the dairy industry of this Province we owe to a large extent our success in the pork and bacon industry.

Dr. FLETCHER said that there are large districts still in Ontario where there is no danger from the weevil. Peas have been sown from Newfoundland and Prince Edward Island, and occasionally these peas have, to a very small degree, been infested, but not to any extent. I think that in the case of the San José scale it will spread from its centre. The San José scale started in California, was then introduced in the Eastern States, gradually spreading from its centre, and if it had not been for the active measures adopted by the Ontario Government it would have spread throughout the Province more than it has, and the people of the Dominion ought to recognize what has been done by the Province to save them. They grow magnificent peas in Quebec, and they stopped because the crop fell off. They had been in the habit of specially treating their land to put back what they had taken from it. They stopped this and then their pea crop fell off. Some people connected with the trade find it necessary now to send to Europe to have their seed grown, and we shall lose our trade unless we wake up.

The CHAIRMAN : I think the way to reach the people would be for the Government to issue bulletins.

Prof. JAMES : They have had the information a dozen times through bulletins ; they get it year after year.

Dr. Fletcher: Mr. Carruthers has written me as follows:—"One of our largest buyers writes us that they are getting shipments from Calcutta and the quality is very fine, being free from bugs, and better than any we are shipping him from Canada. They also say they are buying them at one shilling per quarter, which is equal to 3c. per bushel, less than we are asking for our No. 2 grade of the present crop."

Dr. Fletcher then moved the following resolution, seconded by Prof. Lochhead:—

Resolved, That the Entomological Society of Ontario request that the Superintendent of Farmers' Institutes have the matter of the Pea Weevil brought prominently before all meetings of Farmers' Institutes during the winter; that from the discussion held this afternoon, the cessation in the cultivation of peas for two years is not the best remedy for preventing injury by the Pea Weevil, but rather the making known as widely as possible the nature of the pest, the extent of its injuries and the best remedies, and that if object lessons could be given throughout the country showing the way to fumigate peas and the advantage of doing so, it would materially help to reduce the injury by the weevil.—*Carried unanimously.*

Dr. Bethune: I should like to ask if it would be practicable to have some Legislative enactment to compel seedsmen to fumigate their peas. I do not think there would be the slightest use to pass an Act of the Legislature with regard to the general public, but we might get at a large proportion of the seed peas by rendering it compulsory on the part of the seedsmen to fumigate them. I know that not many years ago, in the neighborhood of Port Hope and Cobourg, and all through Prince Edward County, where all kinds of fancy peas were grown by the acre, that every seedsman had his "bug house" and fumigated all the seed, but it seems that some have discontinued that laudable practice. I was intending, before this resolution was read, to suggest that the Ontario Department of Agriculture might issue a mandate to those who attend Farmers' Institutes to make this a point of their proceedings during the coming winter, and if that were done, then if not only the Agricultural press, but the press generally, would take up this subject, and bring home to the whole country the seriousness of it, and the ease with which it really might be dealt, and if in addition to that some experiment were made upon the line Professor Lochhead has mentioned of object lessons, I believe it would have good results.

I remember when not many years ago it was impossible to get good butter in this country in the winter time. When we got butter made from our own cows in the summer time it was all right, but you could not buy butter fit to eat in the winter. That has all been remedied by this object lesson system, the travelling dairies showing the farmers' wives how to make good butter. It has been a great success, and now we can always get good butter, and if that experiment succeeded so well, I think it would be quite worth while to adopt a similar system to teach the farmers how to deal with this terribly destructive pest.

The other day I happened to notice in the market reports from the port of Montreal that the shipment of peas from Montreal up to the first of October last year amounted to 458,000 bushels. This year up to the same date it amounted to 269,000 bushels showing a decrease in one single year in that port, up to the first of October, of 189,000 bushels. This shows what the weevil has done in reducing our exports from one port alone.

I wish to ask Dr. Fletcher if there is any connection between the mildewing of peas and the Pea-Weevil. I mean in this way; is it the case that if the pea plant is not healthy and strong and vigorous, it is far more subject to mildew than it would be if the nourishment of the plant had not been taken by the Pea-Weevil? Would it be more subject to mildew than one grown from perfect seed?

Dr. Fletcher: I do not know from actual observation that that is the case but I can quite understand that the weakened plant would be more likely to be affected. Weevily seeds grow a weak plant which matures later and that would make it more liable to mildew.

Some of the seed merchants fumigate 2,000 bushels at a time by having a properly constructed building and by putting 20 pounds of bi-sulphide of carbon at the top and allowing it to vaporise, which is easily done. The peas can be left in the sack. A farmer with an ordinary coal oil barrel can put 5 bushels of peas in it and fumigate them by using three ounces of bi-sulphide of carbon, which would probably cost 15 cents.

At the present time there are very few seed peas imported into Canada ; because our peas are freer from the weevil than they are to the south of us, but directly we put any sort of pressure on our seedsmen, then the peas will be brought in from the other side.

First of all we want to make it known as widely as we can that it is a serious injury, and then that there is a simple practical remedy, if they will apply it.

Prof. LOCHHEAD : If you compel the seedsmen to fumigate their seeds it will not cover the point, because there is a large amount of seed exchanged among the farmers themselves. The Minister of Agriculture is thoroughly in earnest in this matter. I received a letter from him early in the season, and he wished me to go about it in some way and do something, and of course he will provide the funds. The Minister of Agriculture is a thorough believer in fumigation himself, and he fumigates all his own peas, yet they have weevily peas in his district because the other farmers do not fumigate.

Mr. SMITH : I think Prof. Lochhead has got the correct idea with regard to this particular matter. Some years ago there was established in Guelph what is known as the winter fair. They established a "block test," that is, they show the animal on the hoof first, and then the animal is slaughtered, and they make another test ; that is one of the best object lessons we have in the country, and as a result of that object lesson the Wm. Davies Company of Toronto say, that in one year the quality of the bacon of this country improved 50 per cent. That was wholly the result of that object lesson, and the work done by Farmers' Institutes. If you can get the Institute men to take up the weevil, I am satisfied, you will influence public opinion in this country, and you can then enforce any measure with regard to the weevil. I have gone over the province pretty generally and I find that the evil is steadily extending north. At one time it did not go further than Lake Simcoe ; but last summer and the summer before, I found it up on the shores of the Georgian Bay and it was becoming quite as prevalent as in the frontier counties.

THE PEA WEEVIL.

BY W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Although the Pea Weevil (see Fig. 1, p. 4) has been known as an enemy of the cultivated pea for over 150 years in America, it is not a native. It probably came from the East, whence came so many of our cultivated plants, and their insect enemies as well. Peter Kalm, the eminent Naturalist of the last century, states that in 1748 pea-growing had been abandoned in parts of Pennsylvania, New Jersey, and New York, on account of the pea weevil.

It is apparent that the pea-growing industry in Ontario is doomed unless radical measures are adopted (by the farmers themselves) for the control of the weevil. The pest has made its appearance in nearly every county in the western half of the Province, and in the Lake Ontario counties as far east as Frontenac. The more eastern counties and those further north are not much troubled with the "bug." Durham, Northumberland and Prince Edward used to be the favorite section for growing peas for French and American seedsmen, but the depredations in

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NOTE.—The above paper by Prof. Lochhead was not read in connection with this discussion, but is placed here as a matter of convenience.

these counties have been so great that the growing of peas has been largely reduced during the past two or three years. Amherst Island, which was formerly a great pea-growing district, has scarcely a farmer this year who is growing peas. Throughout Wentworth, Wellington, Waterloo and Oxford the growing of the common cultivated pea has been abandoned, and the grass pea has been substituted to some extent. This latter variety does not suffer from the weevil, but it was attacked this past summer in the counties of Halton and Wentworth by a green louse, the exact nature of which I have not yet determined.

This summer I had the pleasure of visiting the Manitoulins and St. Joseph Island. There the pea-bug or weevil is unknown. Further west, around Fort William and Port Arthur, it is also unknown, and it is the duty of the farmers of these districts to initiate strict measures to prevent the importation of the weevil.

To give an idea of the diminution in the growing of peas during the last 10 years, it may be stated that in 1891 the yield of peas in Ontario was about 18½ million bushels. In 1902 the yield was nearly 11½ million—a decrease of over 7 million bushels in 11 years. The decrease would have been still greater if it had not been for the introduction of the grass pea variety.

The question of treatment is a very important one, and is not a difficult one to put into practice. Unlike many other pests, the pea weevil confines its attention to the cultivated and garden pea almost entirely. It attacks no wild varieties, hence there is no danger from re infestation through those sources. The usual method of treatment is that of fumigation with carbon bisulphide. For several years the pea-growers of Prince Edward and other Lake Ontario counties practiced this method, but there was no wide-spread co-operation in this line of treatment among the farmers. The result was that the weevil thrived in spite of the efforts of many of the largest pea-growers.

The weevil is capable of flight, and it is possible that it may fly comparatively long distances. The first essential in a plan of campaign against the pea weevil is co-operation in the treatment of infested seed, and, without this, the campaign would be useless.

The method of treatment which has been recommended is to fumigate the seed peas in air-tight barrels or bins immediately after threshing. It is usual to use a pound or a pound and a half of carbon bisulphide for every 100 bushels of peas. For smaller amounts, the quantity is proportionately slightly increased. The peas are subjected to this treatment for 48 hours.

The question naturally arises: What is the best time for the treatment of the peas? To answer this question, a study of the development of the grub is necessary to ascertain at what stage the grub ceases eating the pea. Mr. Elmer Lick, of Oshawa, who is a careful, accurate observer, found that in every infested pod he examined that not more than one-half the damage to the pea was done until after the crop was ready to harvest. In many cases he found not more than one-third the damage which the weevil would do before reaching maturity. This was true of both late and early varieties, which were growing side by side. He found, however, that a larger percentage of the early crop were "buggy." Mr. Lick naturally comes to the conclusion that it is highly advisable to treat the peas immediately after harvest, and not to wait until the grub has become full grown.

Mr. Lick's conclusions regarding the treatment of peas are as follows:—

1. Do not sow buggy peas without treating the weevil.

2. Harvest the crop as soon as ripe, and thresh at once.

3. For seed peas, treat at once; but if for feed close up the concave of the machine tight; use full speed, and thus crack the peas and kill every weevil; or, if it is not desired to cut up the straw, run the peas, after threshing, through a crusher. (Mr. Lick would not care to risk grinding fine, for fear of heating).

"You must quit growing peas, unless there is co-operation in some way."

Mr. Lick thinks a great deal of coal-oil as a treatment. He uses about one gallon to 10 or 15 bushels of peas. The oil is applied in such a way that the peas are thoroughly covered.

In 1897, Prof. Zavitz, of the Experimental Department of the Ontario Agricultural College, made some interesting experiments to find the value of peas for seed which had been injured by the weevil. He found that in the case of a large variety of pea, like the Marrowfat, about three-fifths of the peas which had been injured by the weevil did not germinate. In the case of a small variety of pea, such as the Golden Vine, he found that only thirteen per cent of the peas which contained the weevil grew. Thus he says,—"If a person were sowing weevilly seed of the golden vine variety, it would be necessary to sow 15 acres of peas in order to get as many plants as would be produced from sowing 2 acres of sound seed."

There is one interesting fact which I observed while in St. Joseph Island, which was that, although weevilly peas are sown, the weevils never make their appearance on the new crop. Whether this peculiarity will hold out many years, it is impossible to say, but such is the case at present.

The life-history of the pea-weevil is as follows: The weevils deposit their eggs singly on the outside of the newly formed pods, and when the peas are in blossom. The grub, as soon as it is hatched, bores through the wall of the pod and enters the pea. Within it, it eats and grows. When full grown, it is about one-fourth of an inch long, and about one-eighth of an inch in thickness. It has three pairs of minute legs, but otherwise it is decidedly maggot-like. Its body is wrinkled, and is beset with a few long hairs. In its pupal state, it rests for a few weeks in a round burrow, which is closed externally by the unbroken membrane of the pea. The winter is passed in the adult state, either within or without the pea, but usually within.

I venture to outline a plan of an experimental campaign against the weevil, and I would like the members present to discuss it as to its feasibility and probable value. The plan i based on the idea that if the entire pea-crop of a section is threshed and treated with carbon bisulphide immediately after it is harvested, the weevils in that section will be practically exterminated. I suggest, therefore, that a corps of men be appointed to treat the peas that are grown on every farm in a group of two or three townships. The pea-growers should be asked to assist in the work by providing the necessary barrels or tight bins for proper fumigation. To each member of the corps, there could be allotted all the farms on one or two concessions. Every farm would then be visited, and the peas fumigated properly. It might be necessary in some instances to fumigate the peas twice if there was any doubt as to the thoroughness of the first treatment.

The same plan could be followed out the second season. If the weevils are still abundant the third season, the treatment would be considered a failure, providing no weevilly peas had been introduced during the period of experimentation.

REPORT ON INJURIOUS INSECTS IN 1902.

Division No. 4.—Niagara District.—By Geo. E. Fisher.

Not being schooled in the science of entomology you will readily understand that I naturally shrink from accepting office in this society and reporting from the standpoint of an entomologist. My indebtedness to entomologists for assistance in prosecuting the San José scale investigation, a desire to reciprocate, and being assured by Prof. Webster and particularly by Dr. Fletcher that they themselves are only students and that I am abundantly qualified to act in this capacity, are my apology for attempting to do so.

The opinion seems to prevail that in continually moving about the country in my official capacity I enjoy exceptional opportunities for observation and should know a great deal. While it may not seem altogether unfair to expect considerable of me in this way, the particular work in which I am engaged has so continually demanded my full time that the opportunity for thorough and careful investigation outside of matters pertaining to the San José scale is not nearly so satisfactory as when at home I went leisurely about my own orchards and, with necessary appliances always at hand, worked out such questions.

My practice has been not to accept any statement I could not verify in the field and in my judgment he who demonstrates beyond question one subject in a whole season has accomplished much more than another who has given but superficial attention to a greater number.

Notwithstanding the almost entire absence of such weather as makes ideal conditions for insects, in many instances they were present in usual quantity. The cabbage worm, striped cucumber beetle and squash bug, asparagus and potato beetles are spoken of by gardeners as having been troublesome. The potato beetle made a record, for when the vines succumbed to blight, in their efforts for self preservation the beetles attacked almost everything else, tomatoes and particularly egg plants were protected with the greatest difficulty. There were instances of tomato plants being eaten off in large quantity, by potato bugs which attacked them below the surface of the ground, before the potatoes were up in the spring. The asparagus beetle is spread over the whole of the Niagara District, and where left to itself seriously injures the crop. There are several methods of controlling it, and those which are perhaps the most successful and most generally adopted are very simple. The insect prefers the more spindling shoots which are allowed to stand and are destroyed as soon as they become considerably infested. Little chicks catch and eat the beetles, and if moved about in portable coops a single brood will protect an area of quite large extent, when cutting is discontinued the plantations are sprayed with paris green or arsenic. A gentleman at Queenston suggests a solution of saltpetre, one pound in ten gallons of water, for the suppression of cucumber and squash beetles. Others are using whale oil soap one-pound in four gallons and find that it is safe for very tender plants and besides relieving the vines of insect pests so invigorates their growth that its use is economical for this purpose alone.

CANKER-WORM.

Canker-worm (Fig. 2) was not so generally plentiful this season as last, but was still numerous in certain sections, where orchards were stripped as usual. Little rain fell during the larval period, which afforded a much better opportunity for spraying this year than last, when the almost continuous rain washed off the poison as fast as it was put on. In 1901, so unsatisfactory were the results from trying to kill Canker-worm by spraying, that in the fall a few growers resorted to the sticky bandage process. Even with the weather conditions favorable, spraying a large number of trees is a heavy undertaking, but those of 1901 showed that Canker-worm cannot always be controlled by spraying, though the pumps be kept going and the best of material used. In my own orchards, we had not been successful in the spring, and in the fall made an experiment of sufficient extent to fully test this method. Beginning Nov. 1st, 2,000 apple and 6,000 plum and cherry, all bearing and mostly full-grown trees, were treated. Pear and peach were not attacked, though a few years ago a neighbor had serious trouble from Canker-worm in his pear orchard. At the above date, the weather being rather cold, pure castor oil and a good quality of resin were used in the pro-

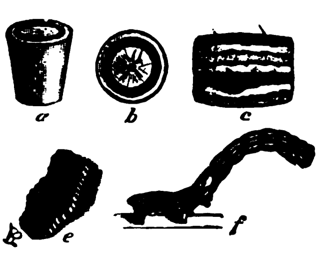

Fig. 2. Fall Canker-worm. *a* and *b*, eggs seen sideways and from above; *c*, markings on segment of caterpillar; *e*, mass of eggs; *f*, caterpillar.

portion of equal parts by weight; in warmer weather five parts of resin to three of oil would be required. A space of six inches or more at a convenient height was scraped on rough-barked apples and the surface made as smooth as possible. The mixture while warm was applied to the bark with a brush, a strip around the tree two inches wide, which spread to four. The heavy bark of the apples soon absorbed this first application, which was promptly renewed. In the course of the season it was found necessary to treat the apples three times and the plums twice. A few moths were moving when the treating was commenced, and some of these no doubt had already reached the branches. As the season advanced and thousands upon thousands of the sluggish egg-laden moths became entangled in the wax, the situation was extremely interesting. On one small plum one hundred and fifty moths were counted, and on some of the larger apples the number of moths captured, both male and female, was too many to count. (Fig. 3.) During the spring a very close watch was kept, and as there was no movement, I have concluded that the infestation was wholly of the fall variety. As the males were made prisoners if their wings but touched the wax, there was little and probably no copulation, and Dr. Fletcher has explained that the eggs are likely to be fertilized only in passing the ovary. However this may be, so far as we could observe no eggs hatched, but remained in the body of the parent still held fast by the wax. Some who used this method collected and burned the dead females, but in our case there seemed no necessity. My interest in this matter intensified as the season for spraying came and went with this innumerable host of closely-held captives on the trunks of the trees and no larvæ in the top to spray. The men say there were not as many worms in the entire orchard this year as were on some individual trees last year. This way of treating Canker-worm is not new, but is certainly not generally understood. Mr. O. T. Springer, of Burlington, who has practised this method successfully for years, assisted me with valuable suggestions.

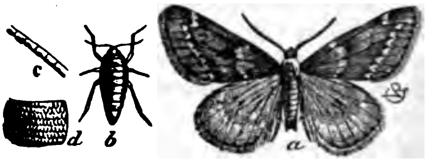

Fig. 3. Fall Canker-worm. *a*, male moth; *b*, female moth.

PEAR PSYLLA.

Early in September my attention was called to an attack of Pear Psylla in an orchard belonging to Mr. Joseph Tweddle, of Fruitland. A block of 125 eight or ten-year-old pear trees was involved. The varieties affected are those in common cultivation, the Bartletts suffering most. Nearly the whole of the block was swarming with wasps, attracted by honey-dew that was dripping from the foliage. The wood was covered with a black fungus which had developed in honey-dew exuded by nymphs attacking the wood.

At the time of my first visit the foliage was largely deserted and the nymphs were concentrated on the wood, particularly the young growth, and the energy of the trees was apparently so reduced as to seriously affect next season's crop, no matter what treatment is given. Some years ago Mr. Freeman, of Freeman, lost an orchard of nearly four hundred large dwarf Duchess from Psylla. He tried to destroy the insects with kerosene emulsion, but used it of too little strength, which had no effect whatever. At home we always have some Psylla, but it is never there in sufficient quantity to necessitate treatment.

In the worst affected portions of Mr. Tweddle's orchard the foliage was so reduced as to make treatment easy, and I advised an application of crude petroleum emulsion, 1 in 10, which would kill nearly all of the nymphs and stop the drain on the trees. We subsequently treated a couple of the trees with the emulsion ourselves, and the effect was even better than I anticipated. This, followed by a thorough treatment with lime and sulphur in winter, will subdue the pest. As the eggs are deposited very early in spring, the winter treatment should not be delayed too long.

WHITE ROSE-SCALE.

This insect has taken to our Raspberry plantations and seems to be widely spread. In fields situated east of Grimsby, it was found in good form both at the beginning and end of April. On the 10th of May it was rapidly increasing in size and by the 20th nearing maturity, but down to this date no eggs had been observed. On May 31st eggs were plentiful and on June 7th were found to be hatching; on the 23rd June eggs were still plentiful, hatching and larvæ fixing on the old canes; at this date the scales were present in all stages of development. These fields were not seen again till September 22nd when eggs were more plentiful than at any previous examination, lice running and fixing on both old and new wood and there were growing scales in all stages particularly on the old canes. The same conditions prevailed on the 25th of October except that the new canes were then heavily infested.

It appears from these investigations that while this scale resembles scurfy barklouse in appearance it differs from it in being multibrooded and in passing the winter alive. I intend making a careful search for eggs at the end of the season to determine whether or not there are eggs in good condition at that time, as the opinion is held that some of the eggs winter over. On September 22nd there were very few scales on the young wood in comparison with the old and not many of these were of advanced growth. If the old canes be removed and destroyed immediately after fruiting much of the spreading will be prevented as it is no doubt later in the season, when larvæ are more plentiful, that most spreading occurs. This precaution followed by a thorough treatment before growth starts in the spring with a suitable wash such as soap, crude oil or lime and sulphur will in my judgment meet the difficulty.

SAN JOSE SCALE (Figs. 4 and 5).

Owing to the cold late spring the larvæ of the San José scale did not appear till a week or ten days after the usual time, but notwithstanding this and the unfavorable weather which followed, reproduction was rapid and the pest was discovered in many orchards where it had not previously been found. In many instances trees that were but slightly infested in the spring are encrusted now and likely to be ruined before the end of the season.

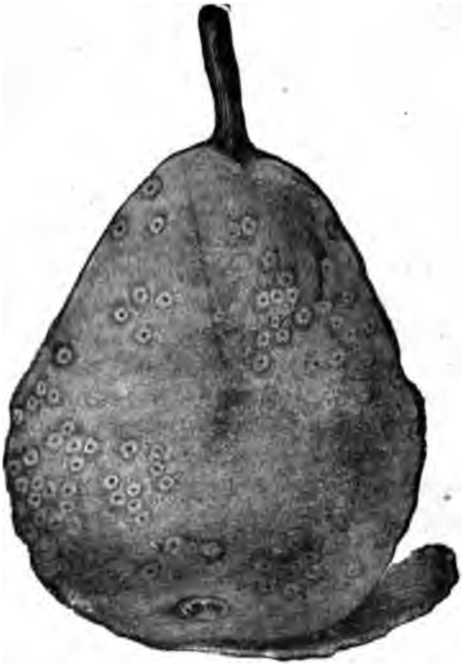

Fig. 4.—Pear infested with San Jose scale.

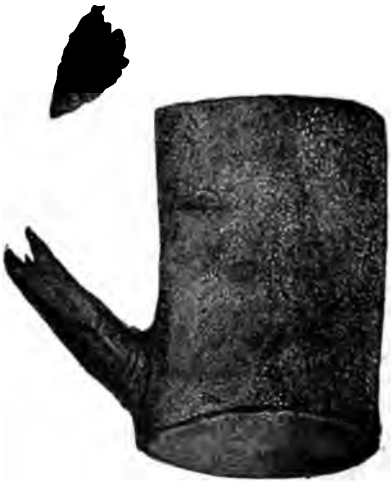

Fig. 5.—Portion of a branch infested with the San Jose scale.

Formerly the practice was to mark for special winter treatment any trees that were badly attacked in summer, but this was not satisfactory as such trees frequently became much weakened and sometimes died before the winter's frosts closed the scale's season.

Recognizing the necessity for prompt summer treatment in such cases much pains was taken to procure an effectual remedy suitable for summer use which would destroy the scale without injuriously affecting the trees. In a long series of experiments emulsions made from kerosene and crude petroleum proved the most satisfactory and are really very useful. The varying results so commonly reported from the use of kerosene are largely due to differences in preparing the emulsions and of the condition of the weather when the applications were made. They should be applied only on warm, dry, bright, airy days, and it would appear that the hotter and dryer the weather is the better will be the result in killing the scale and the safer to the trees. Spraying done on trees in leaf is necessarily imperfect for the foliage prevents the spray reaching every part of the wood, particularly the twigs. For spraying infested trees in leaf we prefer a rather coarse nozzle which sends its spray through the foliage to the wood much better than a fine nozzle. The oils resist re-attack so well that even if there be considerable breeding after the treatment is given it will not matter, for the majority of the young scales which fix will die and the tree will not be badly affected again during the season. Either kerosene or crude petroleum may be satisfactorily applied with a combination pump and diluted with water to almost any per-centage, but to use them with an ordinary pump it is necessary to make an emulsion. Kerosene emulsion 1 in 6 is a suitable strength for hardy foliage and 1 in 7 for peach and other tender foliage. That is one gallon of kerosene in a total quantity of seven gallons of emulsion. Crude oil emulsion 1 in 10 is a suitable strength for hardy foliage. This gives one quarter of a pound of soap to the gallon of emulsion and ten per cent. of oil which is all most foliage will resist. Kerosene is preferable for peach trees. I would spray only badly affected trees in summer and follow this with a thorough spraying of the entire orchard with lime and sulphur in the winter or spring.

Our experiments clearly demonstrate that lime and sulphur is altogether the most effective remedy we now have. It is also the cheapest and the safest. It is easily applied and we hope by utilizing steam from ordinary threshing engines for cooking to make it more easily procured than any other spray. A larger proportion of lime and sulphur than is necessary in California is recommended for our climate. One pound of lime and one-half pound of sulphur to the gallon of wash giving the best satisfaction in our experiments. We found no advantage from the addition of salt, in fact the best results were obtained where no salt was used, and as it seriously corroded the pump we do not recommend it.

It will be interesting to this meeting to know how this remedy appears to work out, and as frequent examinations were carefully made, I may speak with considerable confidence. There were so many living, healthy, developing females remaining that in the early examinations we pronounced the treatment a failure. When the breeding season came we were greatly surprised at finding no larvæ on treated trees and the little yellow lice simply swarming on trees that were not treated. The microscope showed the mature females on untreated trees to be packed with young, while the large, fresh, oily females on treated trees were empty, barren and entirely without any appearance of young about them. The proportion of males in the over-wintered brood is largely in excess of the females and this is nature's provision for complete fertilization in the spring which no doubt is indispensable. The males being on the surface and exposed perished from the treatment, and many of the females protected under layers of encrusted scales escaped, but as there was no copulation there was no breeding.

A most gratifying feature of our work is that it shows clearly that the scale may be easily controlled and the vigor of an orchard maintained independent of surroundings. An orchard exposed to reinfestation is of course at a disadvantage, but even this will not prevent holding the scale well in check if regular annual treatments are given.

And now that these results are secured, fruit growers and particularly those in infested sections, will appreciate the Minister's persistent effort in their behalf, and we trust such thorough use of the remedies will be made as will speedily bring the pest well under control.

Dr. FLETCHER : Said that he was glad to be able to confirm the results obtained by Mr. Fisher in the case of the San José scale.

He had just been through the scene of these experiments with Mr. Fisher and Mr. Gibson, and saw these very trees that were treated with lime and sulphur, and they were just as healthy as trees need to be. The scale was very abundant at the beginning of the season, but now there are only a very small number of living scales there, which shows that this remedy is very effective. The treatment does not cost more than it is worth, and the application of it is useful in more ways than one, because it destroys many other injurious insects, and we have in it a remedy which comes next to the Bordeaux mixture. Lime, sulphur and salt is one of the very best fungicides we know of and when we find that it is one of the best and cheapest applications for destroying the San José scale, and at the same time will remove many other diseases that affect the tree, we should appreciate the efforts of the men who have given us this remedy.

Until the San José scale was introduced into Ontario, our greatest loss was from the brown rot of the plum, and the black spot of the apple. Mr. Evans has a specimen that he is going to show to the meeting, which will illustrate how reports come back from European markets of the fruit we ship. The farmers ship them in comparatively good condition, they only see a small amount of spot upon the apple. This sample will show you what condition these apples are in when they reach the European markets. What does this mean, it means that the fruit growers have not taken the proper care to properly treat their trees ; these apples were shipped in comparatively proper condition ; but the shipment was delayed for three weeks and this is the condition in which the apples were found. [Apples were exhibited which were so spotted and pitted with rot as to be absolutely unmarketable, and yet they were shipped three weeks before in an apparently sound condition.]

Prof. LOCHHEAD : I can assure you there is no person more pleased than I am, at the favourable results of Mr. Fisher's experiments.

Any person who has had anything to do with the San José scale knows the destruction it creates. The question is often put to the Entomologist, what are you here for if you can't get rid of the scale ?

Mr. Fisher was with me at the Pittsburg meeting of Economic Entomologists and I can assure the members here, that we are ahead of the United States as far as the treatment of San José scale is concerned. Although they reported the results of the lime and sulphur treatment, there was a good deal of divergence of opinion at that meeting.

Mr. FISHER : There seems to be some difficulty in cooking this mixture properly. The lime and sulphur preparation requires a great deal of cooking Two hours are absolutely necessary and three hours are better than two. I am not a chemist and I cannot explain the trouble from a scientific stand point. Our practice has been to put a quantity of water in a kettle and bring it to a boil, we then put the lime into the boiling water, and as soon as we got it slaked, we threw in the sulphur. The slaking of the lime seems to have a good effect in reducing the sulphur. This is cooked for two hours. When the sulphur is first introduced into the lime, the mixture is of a light silvery color and it remains about the same color during the first hour and a half, then it begins to shade away to a dark deep amber, and some that we cooked longer became a greenish color and had quite a green cast. If the mixture is properly made you cannot wash it off the trees, nor can you wash it off your hands, if you get any on.

When it becomes cold the lime and sulphur appear to crystallize and we have water and crystals, but we cannot stir it up neither can we restore it to life by cooking, and it will not stick when we put it on the trees. The preparation must therefore be applied while hot.

The **Chairman**: After it is in condition to apply to the trees, how long before it crystallizes?

Mr. **Fisher**: As soon as it gets cold; it would probably take half a day to cool. There is no trouble in getting it on after it is prepared, if you are not interrupted.

Mr. W. E. **Saunders**: As regards the chemical nature of this compound, it might be of interest to state that when the lime and sulphur are combined together, they make sulphide of calcium, and sulphide of calcium freshly made is soluble. It has been in use in the drug business for a long time as a remedy for skin diseases, and I have found that in the strength which we make it, which results in a bright brick-red solution, it does not crystallize. I should think that the crystals occur from making the solution too dense. We have a solution in stock now, that has been made for perhaps three months or six months and it is still of a deep orange-red color; it contains sulphide of calcium and probably some sulphur. This solution we have bottled up and it is in good condition to-day. When it is exposed to the air it forms upon the surface a flake of a mixture of sulphur and sulphide of calcium. Decomposition, no doubt, will go on to a more rapid extent as it is exposed longer to the air. I should think that by putting this material in barrels, filling them right to the top, and putting the plug in the bung, it could be kept for weeks. If you have more sulphur than the solution can take up, it might possibly take it up while hot and throw it down when cold. If it had an excess of either one it might leave the residue in the bottom.

Mr. **Fisher**: We have very little sediment; the mixture appears to be perfect We did have a lighter wash, but it left the sulphur exposed, so that it would be blown away by the wind or washed off by the rain, whereas by using a pound of lime and half a pound of sulphur to the gallon of wash, it left the sulphur covered. The sulphur seems to be deposited between the lime and the bark of the tree.

Prof. **Lochhead**: I had a talk with a chemist at the Pittsburg meeting and he stated that when you boil sulphur and lime together, you get various kinds of sulphide of calcium There are sulphides of a high and a low degree, and these differ very remarkably.

Prof. **James**: This is one of those things where the practice is of far greater value than the theory. We all know that the various forms sulphur assumes depend entirely upon the temperature to which it is heated. The use of the lime and sulphur mixture for the treatment of the San José scale in the eastern part of California has presented a very interesting feature to me. Perhaps most of you know that in the early days this favorite stand-by, or method, used in California was used here, but we were told by the American Entomologists that it was not at all applicable to the eastern part of the continent. It is quite evident now that our American friends came to a conclusion too rapidly, because when Mr. Fisher's department used that treatment he wrote to a large number of the Entomologists on the other side, and in their replies they admitted that their previous conclusions were hardly correct. Mr. Fisher has practically shown them the way in this matter, and I think we can safely say that his experiments are in advance of anything that has been previously done in the Eastern States, or the Eastern half of the Continent. The only way in which they can be said to have gone beyond us is in the very important work done at the Department of Washington, in sending to China and Japan for the natural parasites of the insect. It seems that after trying many experiments, we have got out into the light and are now where we have some safe and sure footing with regard to this insect.

Dr. **Fletcher**: With regard to what Prof. Lochhead has said, that this work was shown o be of great importance at the Pittsburg convention, the suggestion has been made that our work was as good as any in the United States. We can say that it is better than anything that has been done hitherto, and more than that, it is far more extensive than anything that has ever been done in the United States. During the last four years Mr. Fisher has been working continuously throughout the summer. The best work done in the United States has been done by an Entomologist who has a class to teach and other work to do, whereas, Mr. Fisher has given his whole attention to the work and we have these good results.

If a thing is worth doing and it will pay to do it, our farmers will do it. Seventeen years ago there was not a spraying machine in Canada, and now there are more than a million, because the people have been shown that it pays to use them. And so it will be with the treatment for the San José scale.

Dr. Fletcher then moved, seconded by Dr. Bethune, "that the Entomological Society of Ontario have watched carefully the efforts of the Hon. the Minister of Agriculture and his Officers to discover a practical remedy for the San José scale ever since its first appearance in Canada, and the Society now feel that they can justly, and they do hereby, tender their congratulations to the Minister for the excellent results which have been obtained through the discovery of a practical remedy for this most destructive insect."—*Carried unanimously.*

The CHAIRMAN: It is very great gratification I am sure to us all that a member of our Society, and one of its Directors should have accomplished the very good work that he has done; we also feel that an immense deal of credit is due to the Minister of Agriculture for the thorough way in which he has caused these investigations and experiments to be conducted in the face of a great deal of opposition. We feel grateful to him for what he has done, and also to his officers for their excellent work.

EVENING MEETING.

A public meeting of the Society, to which the members of the London Horticultural Society were specially invited, was held on Wednesday evening, October 29th, in a lecture room of the Normal School, by kind permission of Principal Merchant. At 8 o'clock the meeting was called to order by the President, the Rev. Dr. Fyles, who said:

Ladies and gentlemen we are happy to meet you again to talk of the beautiful objects in which the Society is interested, and to tell you of some facts concerning them. I beg to request Prof. James to take the chair this evening.

Prof. James: Mr. President, ladies and gentlemen, I accept very readily and very willingly the invitation of the Entomological Society to occupy the chair on this occasion; partly because of the high appreciation I hold of their work, and partly also because we of the Department of Agriculture who are more intimately related to that work, get from them so much assistance in connection with our own work. We have been holding a session this afternoon, and have been discussing two questions in particular. They are of very great moment to the people of this Province. We have been discussing very small things indeed. Things so small that in order to be detected, in some cases at least, they must be put under a powerful microscope. These small things mean a great deal in connection with the development of this country; they are the Scale insect that affects our fruit trees and the Weevil that destroys our pea crop. If the Society had done nothing else in connection with their meeting, but to prepare for publication the information that will be collected, then they will not have met in vain.

It is not many years since Entomology was looked down upon. It is only within the last few years that it has received that attention which it deserves, and I am afraid that even yet Entomology in most of its departments is not receiving the recognition it fully deserves. We are finding more and more enemies to our crops, and as they come before us we turn to the specialists, those who have made a special study of Entomology, and apply to them for help and assistance, and as these men put into practice the results of their investigations, the people as a whole are coming to the conclusion that after all these men are not merely men of theories but are men of practice, and I think we shall find in connection with this Entomological Society that theory and practice are working hand in hand as effectively as in connection with any other society organized for the general welfare of this Province.

Entomology is a subject which is not only of very great consequence to me, as these two crops I have mentioned will give evidence, but it is a subject of very great interest. It came out in discussion this afternoon that the pea crop of this Province during this past year was worth from four to seven million dollars less than it was about ten years ago. This falling off in production is to be attributed to the destructive work of a minute insect. If our entomologists can give us a simple remedy whereby the ravages of this insect can be overcome, you can understand how very practical their work must be.

We have not a very long programme to lay before you this evening, but I think that you will find that what we have to give you will be full of interest.

I have now very much pleasure in introducing to you the Rev. Dr. Fyles of Quebec.

Dr. Fyles then read his presidential address and illustrated it with a series of beautiful diagrams, the work of his own hand.

INSECT LIFE.

By Rev. Thomas W. Fyles, D.C L., F.L.S.—President.

The old Roman poet, Lucretius, made known, in lofty strains, his ideas upon Natural Things. His poetry was better than his philosophy. He held the opinion that the soul of man was diffused in atoms throughout the body. He argued that if, on the death of the body, any of these soul atoms remained in it, the soul could not properly be accounted immortal, because it suffered diminution. But, he continued, if the soul left the body with all its parts entire, how do you account for the boneless, bloodless creatures that are found in, and upon, the carcass? He seemed to think that the soul particles could embody themselves anew in different ways. If Lucretius had been an Entomologist, and had known the life histories of the Silphidæ and Muscidæ he would not have entertained opinions so absurd.

The great question of Life baffled him, as it has baffled many a philosopher since.

The boys, at the school I attended as a child, pointed out to me a celebrated surgeon, a lecturer on Anatomy, who, they said, was endeavoring to find out the nature, and the seat, of life We regarded him with awe; but he never made the discovery—he died, and his place knew him no more.

Distinct from the highest meaning of the word Life, the Theological meaning, which we understand in our Saviour's declaration, "They would not come unto Me that they might have life," the word is used in various senses. It is used to denote :—

I. Vitality—the power by which we live and move and have our being.

II. The period between birth and death.

III. Energy, vigour; as in, He is full of life.

IV. The condition and habits of life; as high life, low life.

V. A multitude of beings; as the city teemed with life.

VI. A life history.

There are other meanings, but these will suffice for our present purpose.

With the term Insect Life we are very familiar. The late Prof. Riley conducted under it, as a title, a publication which is highly valued, as a very treasury of Entomological information. Let us, in our consideration of Insect Life, transfer to it the meanings above enumerated.

I. And first as to the vital power. Of this it may be said that, as in the case of man, so in that of the inferior creatures, no physiologist has ever been able to make plain to us its nature and its seat. We speak of certain organs as vital organs; and we are able to trace the respiratory, digestive, nervous, muscular and reproductive systems; but the grand power that brings all into play remains a mystery. It came from God; and, when He taketh away the breath of His creatures, they die and return again to their dust.

What is the first and ordinary indication by which we judge that an insect is alive? It is *its ability to move.*

We notice on a Basswood an appearance as of a triangle of small twigs, some brown, some green. We examine it closely and perceive that we have an object before us with a head, and a trunk, and jointed limbs. Is it alive? The creature stretches out a limb, and we know that it is alive. It is *Diapheromera femorata*, Say. Fig. 6.

Again we see on a twig a small creature that in build resembles a Guinea-fowl with head and neck extended. It is brown and hard, and might, you think, be taken for a thorn. Suddenly it springs out of sight. You might say of it, as old John Willett said of May-pole Hugh, "You look, and there he is: you look again, and there he isn't!"

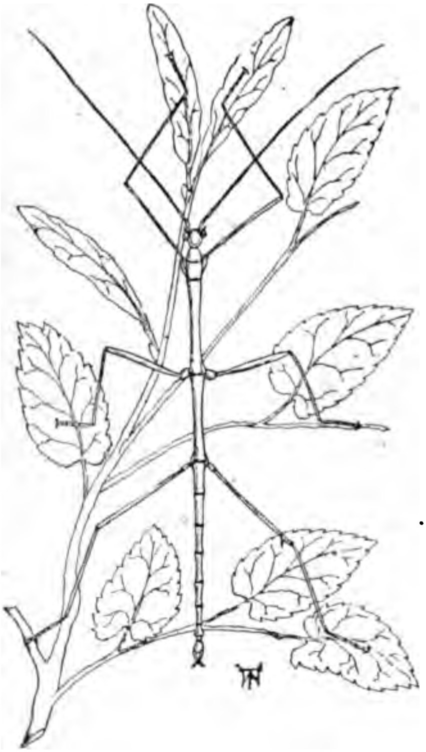

Fig. 6. Walking-stick insect (original).

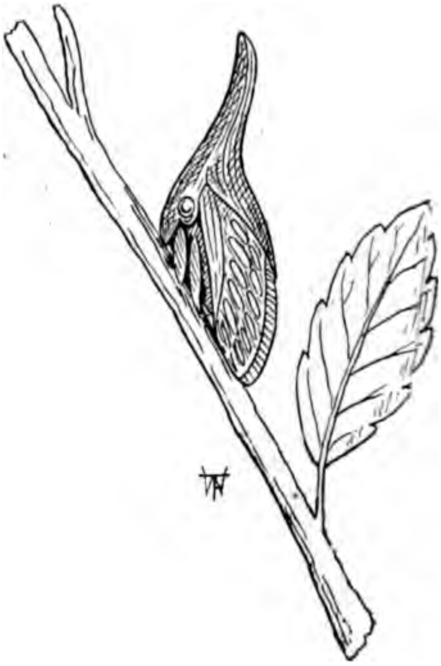

Fig. 7. Leaf-hopper, much magnified (original).

Or again you see a piece of bark, as you suppose, projecting slightly from the boll of a tree. It is brown and ridged, and has marks as if, at some time, a small twig on either side had been broken off. You give it a poke, and it swerves; and some small feet are protruded; and you perceive that it is a living moth (*Calocampa curvimacula*, Morris).

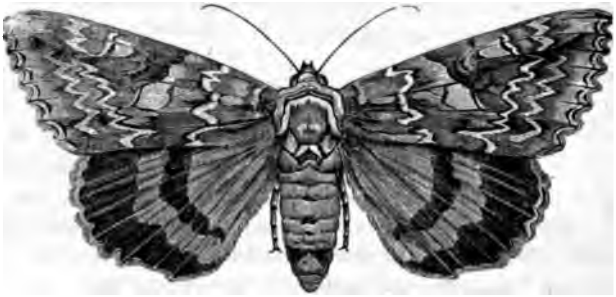

Fig. 8. Catocala parta (Red Underwing Moth).

And once more, you notice a seeming patch of lichen on a birch-tree. You approach to examine it; when suddenly, from beneath the deceptive fore-wings, a pair of gorgeous scarlet secondaries are displayed; and the creature flies off to a place of security It is *Catocala parta* Guen. Fig. 8.

How rapid the nervous action—how great the muscular force, that can carry the frog-hopper out of reach, that can display, and set in motion, so effectively, the ample wings of the moth!

There is a beetle (*Limulodes paradoxus*, Matth.) so small that it looks like the dot that we place over the letter *i*; yet it is gifted with nervous and muscular forces according to its need; and we can—

——"trace in nature's most minute design
The signature and stamp of power divine,
Contrivance intricate, express'd with ease,
Where unassisted sight no beauty sees,
The shapely limb and lubricated joint,
Within the small dimensions of a point,
Muscle and nerve miraculously spun,
His mighty work, who speaks and it is done,
The invisible in things scarce seen reveal'd,
To whom an atom is an ample field." *

In the progression of caterpillars a remarkable phenomenon may be witnessed. If a semi-translucent caterpillar be placed, when in motion, against the light—as upon a window pane—there will be observed a backward muscular action, within the body, which takes the appearance of a succession of wavelets passing from segment to segment, from the head to the farther extremity. It is owing to the nerve power passing from ganglion to ganglion and acting, in order, upon the muscles that set the legs in motion and cause the real advance — the backward flow causes the forward movement. When an Iulus is in motion, you see each pair of its numerous legs move forward in succession with the utmost regularity. (Fig 9.)

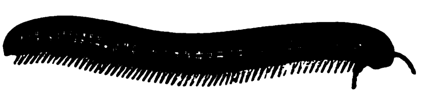

Fig. 9. Iulus multistriatus.

Respiration, and the reception, digestion and assimilation of food are as necessary to the life of the insect as they are to the life of man: and the insect is provided with organs admirably suited to carry on these functions, and with others according to its need.

II. We may call the period of the insect's existence its *Life*.

Insect life in this sense is made up of four successive stages—the *egg*, the *larval*, the *pupal* and the *imago* stages.

Some kinds of insects pass through all these rapidly, as for example, the House Fly. With it, the egg stage lasts only twenty-four hours.

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* Cowper. *Retirement*.

The following table, which I have made up from the last five completed volumes of the *Canadian Entomologist*, will give an idea of the usual length of the egg stage of insects :—

Colias interior, 6 or 7 days, Lyman, Vol. XXIX., No. 11.
Epirranthus obfirmaria, 13 days, Fyles, Vol. XXIX., No. 11.
Brephos infans, 8, 9, or 10 days, Brainerd, Vol. XXIX , No. 11.
Trigonophora periculosa, 10 days, Fyles, Vol. XXXI., No. 2.
Euprepia caja, 9 days, Gibson, Vol. XXXII., No. 11.
Arctia phalerata, 7 or 8 days, Gibson, Vol. XXXII., No. 12.
Xylina Bethunei, about 14 days, Lyman, Vol XXXIII., No. 1.
Phlyctœnia ferrugalis, 14 days, Fletcher & Gibson, Vol. XXXIII., No. 5.
Arctia virguncula, 7 or 8 days, Gibson, Vol. XXXIII., No. 12.

The most remarkable egg period that has come under my notice is that of *Pamphila Manitoba*. The egg stage of this insect lasts for eight months. In the year 1894, on the 8th day of August, I witnessed the laying of a batch of the eggs. On the 20th day of April, in the following year, I saw the tiny larvæ bite their way to freedom from the shells in which they had lived so long. The other stages of the insect's life were completed within four months—in less than half the period of the egg stage.

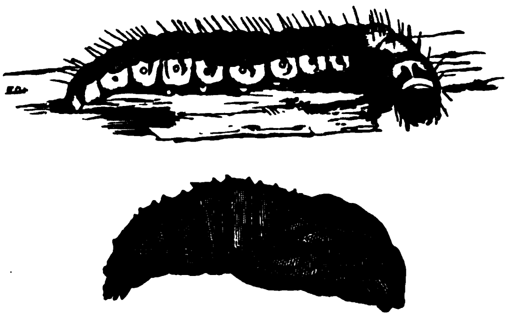

Fig. 10. Caterpillar and Chrysalis of a Cossus.

The larval period also varies in different species. It is the insect's feeding time. In the case of a Bombyx, it is the time when sufficient nutriment must eb assimilated, to sustain the insect through all its after existence. Some larvæ are quickly "full fed," and go directly after into chrysalis. Others spend the Winter in a state of torpidity, and complete their growth in the Spring. Such, for instance, are the larvæ of *Melitæa Harrisii* Scudder. These are gregarious in the Fall, and may be seen (apparently tangled) up in dirty-looking webs upon the heads of the White Aster. When disturbed they strike an attitude, and seem to be all legs. In the Spring they scatter, and feed up on the young shoots of the plant. The butterflies from them appear in June. Their life is completed within a twelvemonth.

But with the Cossidæ the larval stage is greatly prolonged. Packard has given illustrations of *Cossus Centerensis*, Lintner, in which the appearance of the larva is shown after a growth of four months, of a year and four months, of two years and four months, and of three years, when the caterpillar was ready to pupate. (Fig. 10.)

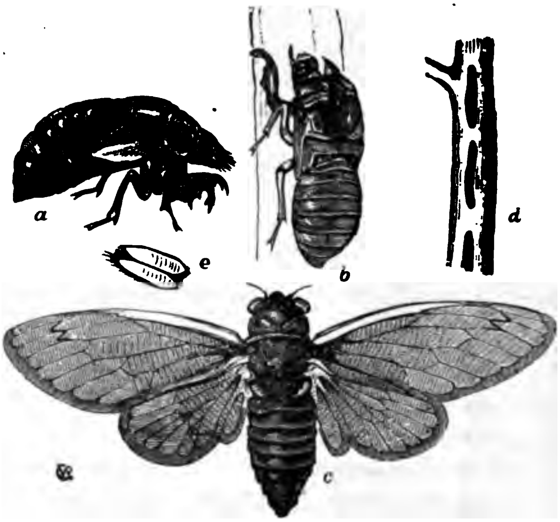

Fig. 11. Cicada septendecim. *a*, larva ; *b*, pupa case ; *c*, perfect form ; *d*, eggs deposited in a twig.

But the most extraordinary prolongation of insect life is that of *Cicada septendecim*, Linneus (Fig. 11). This creature, as its name implies, is seventeen years in attaining perfection. In length of life it stands alone amongst insects.

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III. The energy of many species of insects is surprising—they are full of life. In some cases, as in that of the mosquito, they are—as the little girl said of a troublesome puppy—"*too much alive.*"

On the 22nd of June of this year, I was staying at the beautiful country house of the Honourable Richard Turner, on the Island of Orleans. I looked from my bedroom window early in the morning—it was a bright, sunny morning—and lo, the air was full of light gauzy forms sporting around the trees on the lawn and over the tops of them. There were myriads of the creatures ; and all day long they kept up their mazy dance, seldom alighting to rest. They belonged to the species *Ephemera simulans*, Walker The wings of this species are spotted with brown, and are strengthened with an exquisite net-work of "nerves." The long waving tails of the insects add grace to their movements. (Fig. 12).

If I may, I will here mention an episode, that was narrated to me by the much esteemed Editor of our magazine, Dr. Bethune. Some years ago, an alarm of fire was raised in the town in which he then resided The fire-engines were called out and there was a great commotion From the roof of a large warehouse, near the water, volumes of seeming smoke and heated air were rising and eddying. On reaching the building the firemen found that they had been misled, or, as the boys would say "sold." The appearance that had alarmed the town was caused by innumerable specimens of *Polystichotes punctatus*, Fab, rising from, and sporting over, the roof. (Fig. 13.)

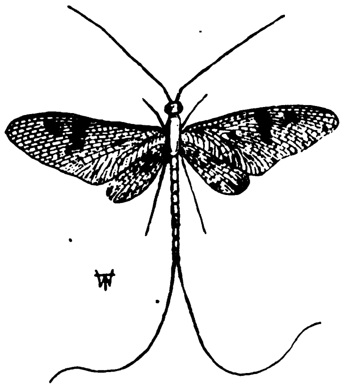
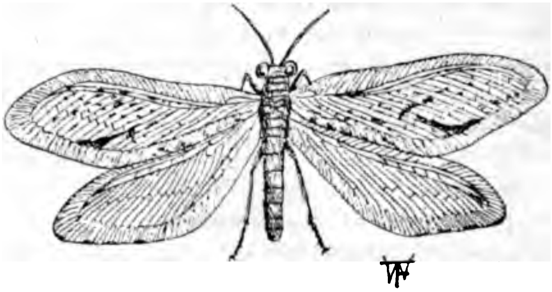


Fig. 12. (Original.)



Fig, 13. (Original.)

Often during the time I lived in the Eastern Townships, when driving home in the calm summer evenings, I noticed above the top of some giant monarch of the forest, a mysterious moving column just discernible against the pale after glow of the sunset. The appearances were due to assemblies of insects, taking their pleasure in the heights.

Who has not noticed the dash with which the bee comes suddenly out of the blue and alights upon the foot-board of the hive, as if, like the clown in the pantomine he would say, "Here we are again !"

That energetic little fellow the Flea, *Pulex irritans*, Linneus, can leap thirty times its own height.

Who has not admired the persistence with which the bot-fly, *Gastrophilus equi*, Linneus, keeps up with the trotting horse and hovers around its legs, till opportunities occur of attaching its eggs to them.

It is the cold breath of approaching winter that robs the insect world of its energy, that takes the life out of it. Apropos of this, "The Duchess" in her story entitled "Her Last Throw" has a little piece of quiet fun. One of her characters, Fay, is speaking :—

"Her voice annoys me. It is so slow—so *drawlly*. It is irritating. It is lifeless. She talks as though she were a fly in October."

"Captain Severn laughs rather constrainedly.

"Oh! And is it in October flies talk? says he. How interesting! After all, the one subject never *quite* mastered is natural history. It is always *full* of surprises."

If flies do not *talk*, they have some mysterious mode of communicating with their kind. One evening, when I resided in England, returning to my home I noticed a number of large handsome moths fluttering around an out-building. I looked about and saw others, coming from all quarters, and as far as the eye could see. I recognized them as males of the species *Lasiocampa quercus*. Presently it occurred to me that a female of the species might have come from a cocoon in my insect breeding cage. I opened the door of the out-building, and—in flocked the moths. So intent were they upon paying their respects to the lady moth, who was really within, that they flew into my hands as I undid the gauze covering of the cage. What called them? A voice unheard by man—a subtle effluvium—or emanations yet more strange? We know not; but they came from far and near, full of life and energy. The female chose her mate; and the rest fluttered disconsolately away, or fell inertly to the ground.

IV. The term life is applied to the habits and mode of living. We say, what a strange life to lead!

The Broad-leaved Aster (*Aster macrophyllus* L.) grows in patches of considerable size in the woods around Levis. In the month of June of this year I noticed that many of the large ground leaves of the plant were folded over, from both sides, and crinkled. On opening one of them I found that a larva had turned the leaf into a cool and pleasant tent for itself, and was feeding upon the parenchyma of the leaf.

This larva was about nine lines in length, and was of a pale green, with dorsal, sub-dorsal and side lines of darker green. The head and second segment were jet black and glossy. The fore-part of the third segment was dull brown—on the after part of it were four conspicuous white patches. At intervals, along the sub-dorsal lines, and elsewhere on the body, were round jet black dots. The spiracles were black. The under side of the larva was pale green. The claspers and anal segment were marked with black.

On June 25th the larva span a capsule-like, white cocoon, open at one end, for the exit of the moth. Its plan was to place itself on the under side of a fresh leaf, upon the midrib; then to affix its threads at a certain distance on either side of the rib, and to draw so much of the leaf as lay between, into a fold or crease. Within this it formed its cocoon.

The moths appeared on July 10th. The insect measured when displayed ten and a half lines across. Its body was four lines in length, and its antennæ three lines. The palpi were dark brown, turned back usually. The basal part of them was spindle-shaped; the terminal point was smaller, long and pointed.

The fore-wings were brown, clouded with darker brown towards the hind margin. They had a sub-terminal line of paler brown spots bordered with black. Beyond the centre of the wings was a pale brown horse-shoe like mark, not very distinct.

The secondaries were grey with a lighter well-marked sub-terminal line, and a grey fringe. The body was tufted at the extremity. The tarsi were ringed with white.

Professor Fernald tells me that the moth belongs to the genus *Trichotophe*, Clem. He does not know the species. I think it probable, therefore, that it is unnamed; and I venture to give it the provisional name of *Trichotophe Levissella*. Its life is a curious one.

I have raised from this species the parasite *Hemiteles mucronatus*, Prov.

The mode of life of a Tortoise Beetle that has lately made its appearance in the neighborhood of Quebec is a remarkable one. The larva feeds on the burdock and the thistle. It moulds its exuviæ and dejecta into a screen which it supports over its body by means of its forked tail—thus disguising itself from its enemies, and sheltering itself from the hot sun. When it goes into pupa it cements itself to the leaf. The pupa is brown and drab, and, round the abdomen, is set with white branched spines. The perfect insect is a pretty pea-green, shield-shaped beetle. I have described it in the *Canadian Entomologist* for this month.

The Syrphus flies (Fig. 14) lead a remarkable life. Their larvæ come from eggs laid upon plants on which aphides abound. They are blunt at one end and tapering at the other, and they have powers of extension and retraction (Fig. 15). They drive their sharp mouth organs into the aphides and suck them dry—as a boy might suck an orange—rejecting the skins. They spend the pupal period of their existence in curious hunched-up cases. The flies are handsome. They sustain their life upon the nectar of flowers, and they may be seen upon the heads of yarrow as late as the beginning of October. There are several species of them.

One day in September I was examining the blossoms of the Turtle-head (*Chelone glabra*), and admiring the beautiful gothic arches formed by the curved stamens and the flocculent anthers. I noticed that the pistil of the blossom extended over these and was bent down in front of them so that it would come in contact with intruding insects and be charged with pollen that they conveyed. I looked round to see what insect would venture to open that Turtle-mouth and tread that arched way. A movement in one of the blossoms arrested my attention and I saw that there was an insect within. So busily engaged in the recesses of the flower was this spoiler that I was able to pluck the blossom and put it and its occupant into a box that I had ready.

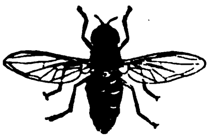


Fig. 14.—Syrphus fly.

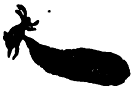


Fig. 15.—Syrphus fly larva sucking out the vital fluids of an aphis.

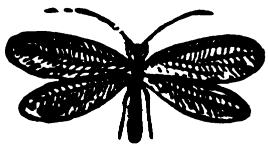


Fig 16.—Lace-winged fly.

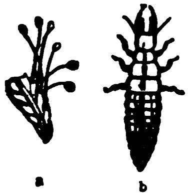


Fig. 17.—Lace-winged fly, eggs and larva.

On reaching home I found that the fly was *Syrphus Americana*, Wied. The Syrphus fly is a beneficial insect—it leads a useful life.

V. We say that the plant is teeming with life, meaning that numerous living things infest it.

At Montmorency, on the 30th of July, I noticed something peculiar in the plants of *Œnothera biennis*, L. that abound there. Instead of growing in a graceful spike, the flower-buds were crowded in a flattened mass. I plucked a number of the heads and examined them at leisure. They were alive with aphides, and preying upon these were larvæ of the Lace-wing fly (*Meleoma Slossonæ*, Banks) (Figs. 16 and 17) and larvæ of four kinds of Syrphus flies, viz., *S. arcuatus*, Fallen, *S. Americanus*, Wied., *Platychirus quadratus*, Say, and *Sphærophoria cylindrica*, Say. I also found in them caterpillars of the noctuid *Alaria florida*, Guenèe, and of a beautiful little Tortrix that is new to me. From the aphides I obtained some minute Proctotrupids.

Another plant that abounds with insect life is the Golden Rod (*Solidago Canadensis*, L). At the summit of the flower-head works the larva of *Pedisca Scudderana*, Clem. In the stem are found the hollow galls of *Gellechia gallo-solidaginis*, Riley, and the pithy galls of *Trypeta solidaginis*, Fitch. In the leaves are the disks caused by the fly called by Osten Sacken, *Cecidomyia carbonifera*. These three last named species are liable to the attacks of parasites. Among the blossoms of the plant lurks the Hemipteron *Phymota erosa*, Linn. awaiting its prey; and numbers of butterflies, moths, bees and flies resort to the plant—it abounds with life.

One of the most remarkable assemblies of insect life that I have witnessed was on the walls of an electric power-house at Cote St. Paul, Montreal. The building was close to the

Lachine canal and near the aqueduct. Low down in front of the building was an arc light. Attracted by this was an innumerable company of Neuroptera. Both the variety of species and the number of each kind were surprising. It was a calm, soft evening, a very gala time for the Neuroptera. In the assembly were the beautifully striped *Macronema zebratum*, Hagen, the elegant *Setodes exquiseton*, Walker, with its golden spotted border, and the diaphanous *Chloroperla bilineata*, Say.

VI. By the word life we sometimes understand a life history.

Scattered through the pages of the *Canadian Entomologist* will be found many life-histories of various kinds of insects. They may not, by the general reader, be deemed as valuable as "Plutarch's Lives," or "Walton's Lives"; but to entomologists they are deeply interesting; and we gladly welcome every addition to their number.

Among the most wonderful of the insect life histories I have read, are those of *Hormaphis hamamelidis*, Fitch, and *Hamamelistes spinosus*, Shimer. They appear in "Technical Series, No. 9, U.S. Department of Agriculture," and are written by Mr. Pergande. The creatures whose lives are recorded are two species of plant-lice inhabiting both the witch-hazel and the birch.

Mr. Pergande tells us that,—"The study of the life history of these, after numerous failures and disappointments, *covering a space of twenty-two years of patient labour*" was at length brought to a successful conclusion. I will speak only of the first named insect.

It lays its eggs in October upon the branches and twigs of the witch-hazel. They produce stem-mothers, which in colour are of a dull black, and are set with white, iridescent waxy rods. Around each of these stem-mothers a gall is formed within which it lives. It changes its skin three times before attaining its growth. It then brings forth its progeny (numbering 100 or 120) within the gall. These are the *migrants*. They grow rapidly, changing their skins four times. At the last change they become winged. They leave the gall at the end of May and seek, and settle upon, the black birch. They are of a dark purplish colour and have colourless or slightly dusky wings.

Each migrant deposits about fifty larvæ upon the under side of the birch leaves. The larvæ change their skins three times, and then present an extraordinary appearance. They are almost round and flat, and have a fringe of cylindrical waxy rods. Their body colour is dusky brown, or black; and, in the fringe, the lowest third of each rod is white, and the other two-thirds glassy and iridescent. The insects at this stage are closely cemented to the leaf. After two generations more, and about the end of August, comes the sixth generation or *return migrants* which undergo four changes—becoming pupæ at the fourth. These pupæ produce the winged insects that return to the witch-hazel. The migration continues throughout September. From these return migrants comes a brood of wingless males and females, the latter of which deposit their eggs upon the witch-hazel twigs in October, as was at first stated.

We have dwelt upon insect life in the different meanings in which the term is used. I trust that your interest in the subject will not end with this night's proceedings. All around us, and all the time, there are natural objects and workings of nature deserving of our close attention. "For everything there is a purpose, and in everything there is a meaning, if only we have the eyes to see it, and the hearts to understand it." The Entomological Society of Ontario was intended to be, and *is*, a guide to nature studies. If any gentleman present be not a member of the Society, I invite him to join it. In entomological pursuits he will learn lessons of God's power and goodness that will strengthen his higher life; he will acquire information that will be of interest and service to him all his life long. His presence at our meetings will give new life to our proceedings. He will find new interests and pleasures that will banish *ennui* from the life he leads; and in the end, if he has proved a useful member of the Society, the editor of the day will, I doubt not, *write his life-history for the pages of the "Canadian Entomologist"!!*

Prof. James: Ladies and gentlemen, we always look for a paper of much interest from Dr. Fyles, and he has kept up the good reputation he has already achieved in this Society by his paper this evening. I have always taken a great interest in the Society and never fail to read anything the Doctor has written. I remember some years ago reading some reminiscences of the life of Philip H. Gosse, a celebrated entomologist who lived in that part of Canada from which the Doctor comes. I consider his paper on the insects of the Bible one of the most instructive papers I have ever read; and others upon the insects of Shakespeare and of our modern poets most interesting and attractive. The Doctor is always able to add a literary finish to his work on entomology. He tells us to-night in one place that natural history is full of surprises, and this reminds me of a little incident I read in a New York paper. Cooper, the novelist, in one of his stories described a young man driving along the road who came to a house, pulled up his horse, jumped down from the rig and tied his horse to a locust. The supposition is, of course, that a locust tree was meant, when, however, the French translator came to this passage he evidently was stuck by the word "locust." He turned to his dictionary and found only one meaning, and that was the locust or grasshopper (*Sauterelle*), and he makes Cooper's young man tie his horse to a grasshopper! This rather staggered the translator, and he thought it necessary to add a foot-note, which ran as follows: "In America the grasshopper grows to a very large size, so they stuff them and add a few weights to hold them down and place them in front of their houses to use them as tie-posts"! The natural history of America certainly is full of surprises.

SOME COMMON BUTTERFLIES, AND SOME NOTED BUTTERFLY HUNTERS.

By Wm. Lochhead, Ontario Agricultural College, Guelph.

The younger students of insects, and those of us who are actively engaged in the warfare against injurious insects, can hardly realize the conditions under which the older entomologists worked; and I make bold to say that we will never know how much we owe to them. We are indeed fortunate in our day and generation. We have ready access to large collections correctly named and arranged through no effort of ours. We have scores of splendidly illustrated volumes, each of which can be bought for a trifle and placed on the shelves of our own library. We have numbers of specialists who can help us out of the many small difficulties which often arise. All of these privileges were denied to the workers of a generation ago, and we marvel at the amount of good work done under obstacles which would now be termed well nigh insurmountable.

It is my purpose this evening to tell you something about some of our great collectors, including some of those stout-hearted men who worked unremittingly without hope of money reward, and more than that, without the sympathetic encouragement of the people whom they were trying to help. They were looked upon as harmless "bug-hunters", and they were allowed to live, because the community believed that it took all kinds of people to make a world. But times have changed. Entomologists are now looked upon as persons who are doing a necessary and a valuable work for the country. Governments spend money on their support, College chairs are endowed that students may receive instruction in Entomology, people are beginning to clamor for a better knowledge of insect-life, and the parents of school children are demanding the introduction of Nature Study into our schools.

I wish to state at the outset that Entomology knows no national boundaries, for the entomologists of all countries form one grand brotherhood of workers. Naturally, then, I shall not confine my remarks to our Canadian band. I shall introduce to you many co-workers from the United States, co-workers whom we always delight to honor, for to them we owe much.

With the aid of the electric lantern, I hope to make quite real both the persons and the insects about which I shall speak. I regret that, through oversight on my part, lantern slides of some of our prominent collectors were not prepared.

The first face shown on the screen is one quite familiar to a London audience. The name of Dr. Bethune is well known in scientific circles throughout Canada, the United States, and Europe. He has been Editor of the "Canadian Entomologist" for upwards of 22 years, and the credit of its present high standing is due almost entirely to his brilliant work. Dr. Bethune was a contributor of valuable papers on insect-life nearly 40 years ago. He is one of the few surviving charter members of the Entomological Society which was organized in 1863. From 1865 to 1873, Dr. Bethune was Editor of the Entomological department of the Hon. Geo. Brown's "Canada Farmer", and for nearly 40 years he has contributed articles to the agricultural papers on subjects of economic importance.

The second face is also familiar to Londoners. Dr. Saunders and Dr. Bethune were a fine team of workers. He, too, is a charter member of the Entomological Society of Ontario, and until he became Director of the Dominion Experimental Farms was one of the leading authorities on Entomological subjects. His work "Insects Injurious to Fruits," published in 1883, is still the best thumbed book on the shelves of the working Economic Entomologist.

The third face is also familiar to Londoners. Mr. J. M. Denton was one of the most earnest collectors of our Society. Readers of the Annual Reports of the Entomological Society recognize how much he helped to make those Reports so valuable.

The fourth face is that of our worthy President,—Rev. Dr. Fyles of Quebec. He and Mr. Lyman of Montreal whose picture follows have done much in stirring up the enthusiasm of lovers of insects in our sister province, and both have done work of real scientific merit.

Our sixth face is that of Mr. Harrington of Ottawa, and is probably not so well known as the preceding, since his duties at Ottawa have prevented his attendance at our annual meetings for four or five years. Mr. Harrington is one of the leading authorities in America on Hymenoptera and Coleoptera. He is one of our younger men, so that much may yet be expected of him.

The seventh face is one well known from the Atlantic to the Pacific. I do not care to say much about Dr. Fletcher in his presence, suffice it to say that his heart and head are as large as his body, and that is saying a great deal. Long may he live to fill the position which he now adorns!

The last Canadian to whom I shall refer is the Abbé Provancher of Laval University, Quebec. In 1869, this indefatigable worker, without the aid of reference libraries or access to reference collections, began the "Naturaliste Canadien" and continued this magazine up to 1891, completing 20 volumes. In the meantime, in 1874, he began his "Faune Entomologique du Canada," a series of volumes devoted to descriptions of Canadian Insects. The first volume, completed in 1877, is devoted to Coleoptera. In 1878-79-80, he issued supplements to this volume. In 1883, he completed a second volume which was devoted to the Orthoptera, Neuroptera and Hymenoptera; and a little later he published additions to his Hymenoptera. In 1890, he completed his third volume devoted to the Hemiptera. He died in 1892. I regret that I am unable to present a likeness of this able French Canadian Naturalist.

Now, I turn to our co-workers in the United States. The first is T. Wm. Harris, who lived from 1795 to 1856. This man was the first paid American Entomologist, and his publications date from 1823. These were followed by a long succession of interesting and original articles dealing chiefly with the injurious Insects of New England. He published a Report entitled "Insects Injurious to Vegetation" in 1841, this being known now as "A Treatise Upon Insects Injurious to Vegetation." As Dr. Howard remarks: "This book is to-day as valuable as when first written, more than 50 years ago." In the early part of his life, Harris worked practically alone; but, in 1854, Dr. Asa Fitch was appointed Entomologist for th State of New York. Dr. Fitch was born in 1809 and died in 1879. He published 14 reports, in all of which are observations and work of a valuable character.

The next picture is that of Townend Glover, who might be called the first entomologist of the Federal Government at Washington. His first report dates from 1854. For the 10 years between 1856 to 1866, Fitch and Glover were the only Economic Entomologists of great note in America.

The next face is that of Benj. D. Walsh, an Englishman by birth, who was a contemporary of Fitch and Glover, but began later than the previous two to write articles along economic lines. In 1868, Walsh was appointed State Entomologist for the State of Illinois. He is said to have been a very interesting speaker, and one who could hold an audience of farmers for hours at a time when he dealt with entomological subjects.

The next face is that of C. V. Riley, who also came from England,—one of the most famous economic entomologists the world has ever produced. In 1868, Riley was appointed entomologist for the State of Missouri. He published 9 annual reports covering the whole field of economic entomology. In 1878, on Glover's death, Riley was appointed entomologist of the United States Department of Agriculture. With the exception of two years, when Prof. Comstock was entomologist, Dr. Riley had charge of the Government work up to June 1894, when he was succeeded by the present entomologist, Dr. L. O. Howard.

Dr. Howard is a leader among entomologists; and, as chief of his department, has been a great success. He has the faculty of gathering around him a strong corps of assistants, and these he encourages to do much original investigation by giving them full credit for all the work they do. Dr. Howard is a prolific writer—his latest important publication being "The Insect Book," an illustrated manual of popular entomology.

Our next picture is Dr. J. B. Smith of New Jersey in his office and laboratory. He is another of our best known entomologists. In 1895, he published a college text-book called "Economic Entomology," a valuable guide to the insects which are of economic value. Dr. Smith is a specialist in the Noctuid family of moths.

The next is Dr. W. J. Holland of the Carnegie Museum, Pittsburg. His specialty is the Lepidoptera, and his most recent work is the "Butterfly Book" which should be in every school library. It is a marvel of cheapness and profusely illustrated with coloured plates.

Next comes W. H. Edwards, the great Lepidopterist. His grand work on the butterflies of North America is a monumental one, filling three large quarto volumes with exquisite coloured illustrations.

The next picture is that of Prof. Comstock of Cornell University. Although an investigator of great originality, his strongest claim on the brotherhood of entomologists is the inspiring influence which he has exerted on the many students who flock to his class-room and laboratory. I may say truly that about two-thirds of all the entomologists in America to-day have been in his laboratory and have come under his influence. His published works are known to every student. They have done much to systematize the study of insects, and to make it possible for the young collector to make headway.

Next comes one of our famous women who have popularized the study of insects. Mrs. Comstock is a meet companion and helpmate for the Professor. Besides being a student of insects, she is an illustrator of insect life and has prepared a large proportion of the illustrations in her husband's books. For the past two years, she has been devoting her attention to the extension of Nature Study in New York State.

The next woman is the late Miss Ormerod of England. She has done more than any other person in Great Britain to build up economic entomology. Her reports published a her own expense, are almost invaluable, and her Manuals are classics.

The last picture is that of Prof. Webster, whom most of our members know well. For many years, he attended our annual gathering, and assisted us in our discussions ; he moreover helped us when we were fighting the San José scale. Having received an appointment in Illinois, he is now unable to be with us, much to our mutual regret.

Now we come to the consideration of some of our common butterflies and moths. (Colored illustrations of the following were presented by means of the lantern) ; Papilio turnus ; Vanessa antiopa ; Pieris rapae ; Anosia archippus ; Eudamus tityrus ; Samia cecropia ; Hyperchiria io ; Phlegethontius celeus ; Everyx myron ; Deilephila lineata ; Tropæa luna ; Œdemasia concinna ; Orgyia leucostigma ; Bombyx mori ; Cutworms ; Clothes' Moths ; Hyphantria cunea ; Acronycta ; Prionoxystus robiniae ; Halisidota ; and Sannina exitiosa.

In most cases, all the four stages egg, caterpillar, pupa, and imago were shown. Such forms as Pieris, Orgyia, Bombyx, Cutworms, Clothes' Moths Hyphantria and Sannina, which are of economic importance, were dwelt upon more at length.

At the conclusion of Prof. Lochhead's lecture, Dr. Fletcher rose and said : I am sure everyone present has been much pleased with the entertainment we have had this evening ; Dr. Fyles's delightful address, full as it was of so many ideas of interest, must have pleased everybody. Prof. Lochhead's illustrations with his remarks will, I have no doubt, teach us a great deal about insects, and I have much pleasure in moving a vote of thanks to Dr. Fyles and to Prof. Lochhead.

The motion was duly seconded and carried unaminously.

Dr. Bethune : Before we separate I should very much like to propose a vote of thanks to the chairman for the very able manner in which he has presided here to-night, and for coming from Toronto to be with us, also for his interesting remarks at the beginning and at other times during the proceedings ; and I should like to add to this vote of thanks the name of Mr. Principal Merchant, who has kindly allowed us the use of this lecture room, and of Mr. Dearness for the able way in which he has taken charge of the lantern.

The motion was seconded and unaminously adopted.

Mr. Dearness made a suitable reply on behalf of himself and Mr. Merchant, and the meeting adjourned.

SECOND DAY'S SESSION.

Thursday, October 30th, 1902.

The Entomological Society resumed its meetings at 11 o'clock, a. m., the President, Rev. Dr. Fyles, occupying the chair. The Directors' Reports on the insects of the year were first called for ; at the close of the reading of each there followed a general discussion on the insects referred to and much valuable information was given. Specimens were also exhibited in illustration of the subjects treated of, many of which were presented to the Society's collections. The reports of the Council and officers for the past year were read and adopted ; the meeting then proceeded to the election of Officers, which resulted as shown on page 2. The reports of the Branches and Sections were read and approved.

In the afternoon the Society met at 2.30 o'clock and the chair was taken by Prof. Lochhead, the newly elected President. After the reading of Reports was completed, papers were read by Dr. Fletcher, Prof. Lochhead, Messrs. Moffat, Lyman, Stevenson, Norris, Gibson and others, and were in many cases fully discussed. The majority of the papers are published in the following pages, but a few, being of a technical character, are to appear in the "Canadian Entomologist," the monthly organ of the Society ; among the latter should be mentioned papers by Dr. Fletcher and his assistant Mr. Arthur Gibson on "The Life-history of the Variable Cutworm, *Mamestra Atlantica*"; by Mr. Gibson on the Canadian species of the genus *Apantesis* (*Arctia*) with special reference to the larvæ ;" and "the Life-history of *Crocigrapha Normani*."

A large number of rare and interesting specimens were exhibited by Dr. Fletcher, Dr. Fyles, Mr. A. Gibson, Mr. C. H. Young, Mr H. H. Lyman, Prof. Lochhead, Mr. J. D. Evans, Mr. G. Chagnon and Mr. A. E. Norris.

The following exhibits were made by Dr Fletcher and Mr. Arthur Gibson :

A beautiful series of *Smerinthus ophthalmicus* reared from eggs received from Mr. J. W. Cockle, of Kaslo, B. C. Most of the specimens were of a beautiful fawn colour, although the female which laid the eggs was of a slaty grey tint.

A series of *Nemeophila petrosa* from eggs collected at Banff by Dr. Fletcher, and to compare with these a series of the form known as *Nemeophila Selwynii*, Hy. Edwards, from Nepigon. Dr. Fletcher stated that although the Rocky Mountain form was extremely variable, one specimen being actually almost undistinguishable from *N. Selwynii*, the species taken at Nepigon was extremely constant in markings. Of hundreds taken during the last ten years he had never been able to catch, or rear, one which approached the western form in the amount of markings. The only difference noticeable between extreme examples of these two forms, which seems constant, is the presence, at the base of the costa of the western form, of an orange mark of varying length.

Life histories of the following species, showing larvæ in all stages, pupæ and moths :

Crocigrapha Normani, Mamestra grandis, Mamestra atlantica.

Two new strawberry pests from Vancouver Island, *Petrophora truncata* and *Scopelosoma tristigmata* were also shown in their different stages.

Hemileuca maia, var. *lucina*, from Mr. Criddle, Aweme, Man.

Coenonympha inornata taken at Ottawa this year for the first time by Mr. A. E Richard.

Erebia disa from Banff, Alta.

A series of *Erebia epipsodea* showing great variation in the undersides.

Lycæna pseudargiolus, var. *nigrescens*, a new variety from Mr. Cockle, of Kaslo, B. C.

Lycæna pseudargiolus, var, *argentata*, a new variety from Manitoba (E. F. Heath).

Plusia formosa, from Mr. W. McIntosh, St. John, N. B.

Semiophora elimata, from Mr. W. McIntosh, St. John, N. B.

Phyciodes Hanhami, a new species from Manitoba somewhat resembling *P. nycteis* on the underside.

The brown-tail Moth, (*Euproctis chrysorrhoea*) a perfect male, the first specimen recorded from Canada, which was taken by Mr. W. McIntosh, at St. John, N. B.

Chrysophanus dorcas, male and female, a species taken on the Georgian Bay, at Nepigon and at Rounthwaite, Man. which Dr. Fletcher believes to be the true *C. dorcas*, of Kirby.

A fine specimen of *Euprepia caja*, var. *Utahensis*, bred from larva received from Mr. E. P. Venables, Vernon, B. C.

Mr. Gibson in illustration of his paper on Canadian species of the genus Apantesis (Arctia) exhibited a fine series of *phalerata* and *nais*, with larvæ in different stages, as well also of specimens of *vittata*, *Anna*, *Williamsii*, with the var. *determinata*, *ornata*, with the var. *achaia*, *phyllira*, *rectilinea*, *Celia*, *figurata*, *michabo*, *Nevadensis* and *complicata*. Besides these he showed three specimens of a species which Dr. Dyar thinks may possibly be *Quenselii*, var. *turbans*, described from Mongolia, and which is new to North America. These were collected at Calgary, N. W. T. by Mr. T. N. Willing, and in a general way somewhat resemble small specimens of *virguncula*.

Rev. Dr. Bethune exhibited the type specimen from which Dr. Saunders described *A. Celia* which is now believed to be a good species.

Votes of thanks were passed to the following :

Mr. C. H. Young, Ottawa, for a donation of specimens for the Cabinets, including inflated larvæ of 6 species of noctuid larvæ.

Mr. A. E. Norris, Montreal, for sending for exhibition a collection of lantern slides take by Mr. A. H. Holden and beautifully coloured by Mr. Norris, and also for sending for exhibition a collection of insects to illustrate his paper on the Insects of the year at Montreal.

Mr. G. Chagnon, Montreal, for a pair of the new species of Dipteron, *Tephronota Canadensi* lately described.

Dr. Fletcher, for a pair of *Chionobas Macounii* for the Society's Cabinet.

Mr. H. H. Lyman, Montreal, for a specimen of *Argynnis Chariclea.*

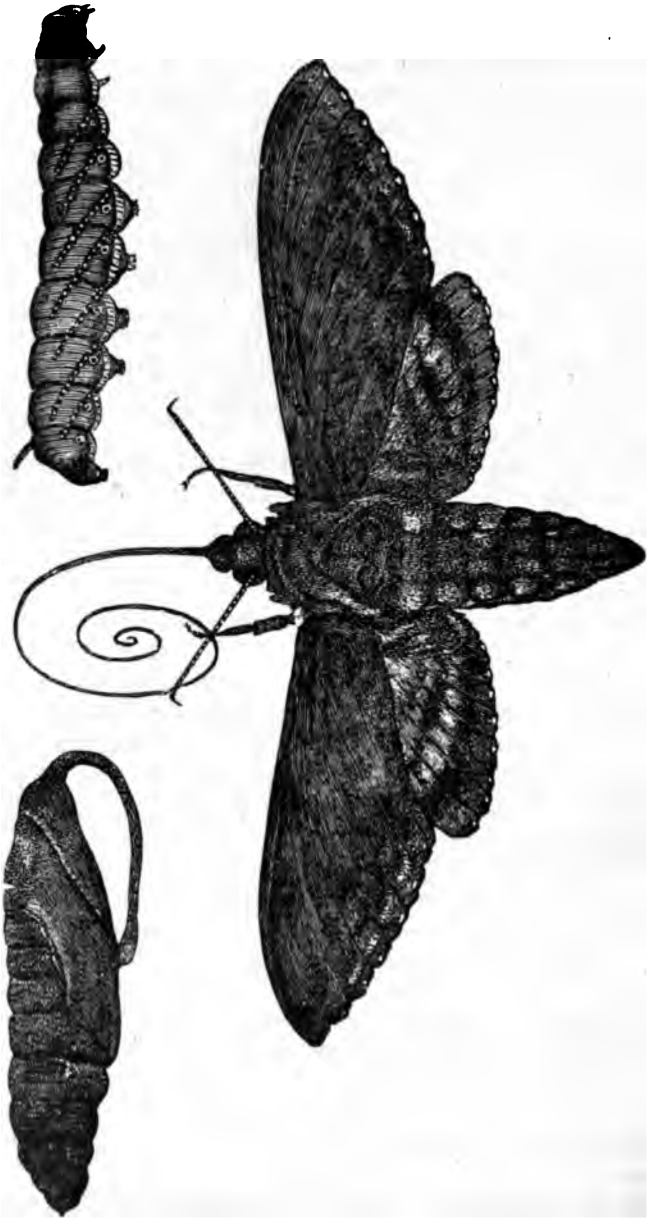


Fig. 19. Protoparce celeus: Caterpillar, Chrysalis and Moth.

REPORTS ON INSECTS OF THE YEAR.

DIVISION No. 1.—OTTAWA DISTRICT. C. H. YOUNG, HURDMAN'S BRIDGE.

The season of 1902 in the Ottawa district has been a very poor one for the collector. The writer, outside of some success he had at Meech's Lake, Que., during a six week's stay, took very few acceptable things.

The very cold and wet season, especially in May and June, doubtless was the cause of such a poor year. In August, which month I spent at Meech's Lake, however, I was fortunate enough to capture a good number of interesting species, some mention of which I will make afterwards.

The most noticeable injurious insect of the season around Ottawa was doubtless the Birch Skeletonizer (*Bucculatrix Canadensisella*) which was so abundant last year, and which, the present season, seemed to do just as much damage to birches of all kinds. It was this year accompanied, however, by numbers of a large, grayish green aphid, and the damage was specially noticeable towards the end of August.

Garden crops were attacked to some extent in this district. The Onion Maggot was very troublesome in some places and caused considerable loss.

Asparagus plants in my garden were rather seriously attacked by the larvæ of *Peridroma occulta*, one of the large noctuid moths. This caterpillar when mature is a large cutworm, and is very voracious, feeding at night, and hiding in the earth at the foot of the plant during the day. Towards the end of September a neighbour of mine brought me some specimens of the Tomato worm (*Protoparce celeus*), Fig. 19, saying that they were doing damage to the foliage of his tomato plants. I immediately went over to his place and in two rows, one about a hundred feet long, the other about fifty, I collected 59 specimens of this caterpillar. On the 1st July I noticed three insects resting on the stem, of a leaf of vegetable marrow, and on collecting them was surprised to see that they were genuine specimens of the Squash Bug, Fig. 20. Dr. Fletcher in his report for 1901, says, "This bug is very rare indeed at Ottawa: Twenty years ago, two specimens were taken here by Mr. W. H. Harrington and none were seen since, although looked for carefully, until the past season, when a few specimens were taken." Dr Fletcher recommends :

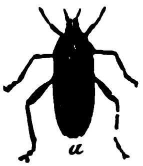


Fig. 20. Squash-bug.

(1.) "Hand-picking, early in the season, of the old bugs when they first resort to the plants, and also of the easily seen egg clusters. This requires an inspection of the vines every day or two. The young bugs may be easily destroyed with a spray of kerosene emulsion, or of whale-oil soap.

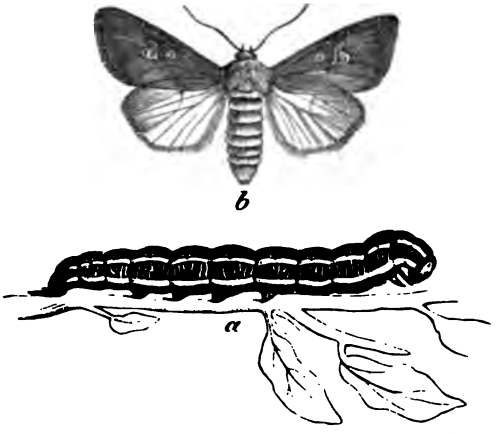


Fig. 21. Mamestra picta: *a*, Zebra caterpillar; *b*, Moth.

(2.) Trapping,—This consists of placing at intervals through the plantation, shingles or pieces of board, beneath which the bugs gather for shelter. By examining these every morning, many may be captured. In a season when the bugs have been abundant, all vines should be burnt as soon as the crop has been gathered. In this way, many of the insects in all stages of development will be destroyed."

The Caterpillars of the White Cabbage butterfly were not so numerous as last year but caused, however, some harm in turnip and rape fields, as did also the Zebra caterpillar (*Mamestra picta*) Fig. 21, which was fairly abundant. Early in the year hundreds of cut-worms of *Noctua fennica* were present in clover fields but I have not heard of their having done serious damage.

During the season considerable attention has been given to studying life histories, particularly of lepidoptera. Many specimens have been reared and some additions made to our knowledge of common species.—Some of the results of this work are submitted herewith showing the larvæ, pupæ, and perfect insects and in some cases parasites also of :—

Hydrœcia cataphracta	In burdock. (*Lappa major.*)
Gluphisia trilineata	On Aspen. (*Populus tremuloides.*)
Edema albifrons	On Oak.
Lycomorpha pholus	On lichen on rocks.
Eudryas grata	On grape vines.
Metzeria lappella	Seeds of Burdock.
Euplexia lucipara	Ferns of all kinds.
Peridroma occulta	Injuring asparagus.
Mamestra legitima	On asparagus and clover.
Papilio asterias	On parsnip, celery and carrot.
Sphinx eremitus	On Mentha and Monarda.
Notodonta stragula	On hazel nut.
Leucania albilinea	On grass and clover.
Pyrameis huntera	On Pearly Everlasting.
Calocampa curvimacula	On Apple.
Arctia virgo	On Plantain, dandelion, etc.
Synchlora rubrifrontaria	On *Quercus macrocarpa.*
Feniseca tarquinius	On *Schizoneura tessellata.*
Ichthyura albosigma	On Aspen. (*P. tremuloides.*)

The following species have also been reared.

Basilarchia disippus	from egg	On Willow.
Grapta progne	"	On Wild Gooseberry.
Xylina Bethunei	"	On Apple.
Xylina disposita	"	On Apple.
Xylina Grotei	"	On Maple.
Ypsolophus pometellus		On Apple.
Hyperchiria Io		On Aspen and basswood.
Mamestra picta		On Turnip
Noctua fennica		On Clover.
Noctua collaris		On Clover, grasses, etc.

I noticed in examining the collections of the Society last year that some of the specimens are faded or imperfect. I have therefore much pleasure in presenting the following which I trust may be found acceptable :

Larvæ of Mamestra picta, Calocampa curvimacula, Noctua fennica, Xylina Bethunei, Xylina disposita, Orgyia leucostigma, Datana ministra ; Moths of Eudryas unio, Lycomorpha pholus (2), Epirranthis obfirmaria (2), Mamestra lorea (2), Abrostola urentis, Alaria florida, Hadena verbascoides, Xylina pexata (2), Cirroedia pampina ; larvæ of Papilio asterias.

DIVISION NO. 2.—BAY OF QUINTE. BY J. D. EVANS, TRENTON.

No cases of serious injury from noxious insects came under the writer's notice, although late in the season *Colias philodice* (Fig. 22) and *Pieris rapæ* (Fig. 23) were quite numerous, flitting about the clover fields containing the ripened second crop.

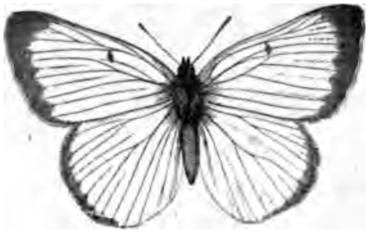


Fig. 22. Colias philodice. Colours: yellow and black.

Much damage has been caused, however, to some orchard and farm crops from the unusual character of the season throughout this section; it having been generally speaking extremely wet and remarkably cool. The principal crops thus severely injured are the apple, clover, potato, corn and tomato. The first mentioned (apple) is very abundant, but the fruit is being destroyed by a fungus growth, which may not appear to be of much consequence when the apples are being packed but develops enormously in a short time and renders the fruit unfit for sale. A sample is herewith submitted of a test case, where a fruit packer put up a barrel of choice apples which had insignificant looking spots when packed; they were packed in the usual careful manner, placed on board of a steamboat and left under the usual conditions of transhipment on board for three weeks, at the expiration of that time they were opened up and found to be covered with the large scabs which appear on the samples exhibited. [The sample apples shown were so damaged as to be perfectly worthless.]

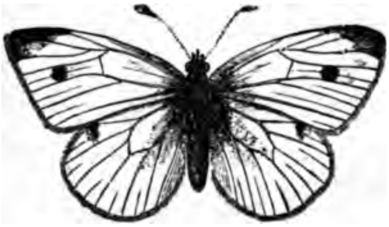


Fig. 23. Pieris rapæ. Colours: white and black.

The potato crop is almost an entire failure owing to a blight which struck the vines when in bloom and developed into rot in the tubers.

A large proportion of the red clover hay was partially, and in cases wholly, spoiled in the curing owing to the continuous rains prevalent at that time. From a like cause coupled with the low temperature, corn and tomatoes, which are grown in large quantities for canning purposes were, generally speaking, a failure.

DIVISION NO. 3.—TORONTO BY E. M. WALKER.

During the present year but few observations were made by the writer on the ravages of injurious insects, owing to a necessary absence from the city during a large part of the season, and being fully occupied with other matters during the remainder. A few of the most prominent pests were noted, however, though doubtless many species of equal importance escaped observation.

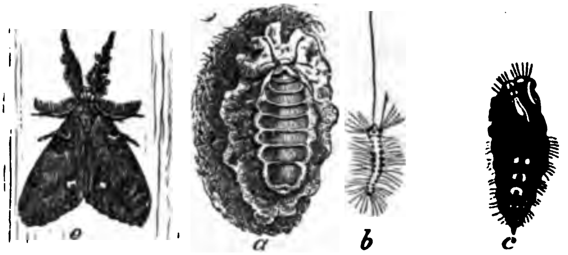


Fig. 24. Tussock Moth: *e* male moth; *a* female moth on cocoon; *b* young larva; *c* chrysalis.

Tent caterpillars (*Clisiocampa Americana*) were not specially bad this year. A few were seen on the wild black cherry early in the season but fruit trees on the whole have been comparatively free from them.

Another enemy of the apple, the Codling moth (*Carpocapsa pomonella*) committed considerable injury this season, and in one orchard, for example, on Davenport Road, evidences of its presence could be detected in about seventy-five per cent. of the apples.

The Tussock moth (*Orgyia leucostigma*) Figs. 24 and 25, is still by far the most formidable enemy of our shade trees, although it appears to be gradually diminishing in numbers and was distinctly less abundant than it has been during the past three or four years. Very few trees were observed that were completely stripped or nearly so, though in the lower part of the city there were a good many badly disfigured trees. Very little has yet been done to control its ravages.

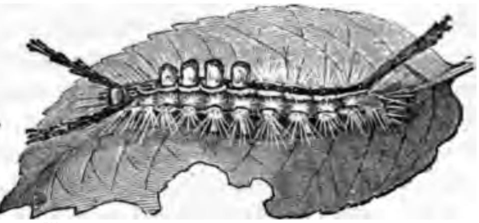


Fig. 25. Tussock Moth Caterpillar, full-grown.

On the above property there was a large plantation of red currant bushes, which, at the time they were seen by the writer (August 15) were almost completely stripped by the larvæ of the imported currant Saw-fly (*Nematus ventricosus*) Figs. 26, 27 and 28. They occurred in ultitudes and in various stages of development, and although the currant bushes were nearly bare of foliage, an adjacent patch of gooseberries was almost entirely free from the pest. Notwithstanding the condition of the foliage the fruit was abundant and of large size.

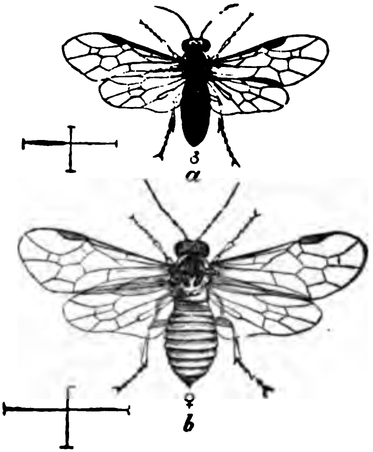


Fig. 26. Currant Saw-fly : *a* male ; *b* female.

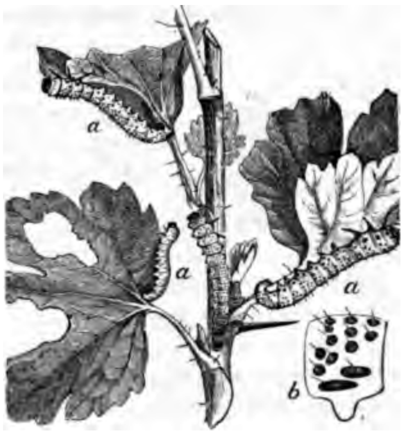


Fig. 27. Currant Saw-fly caterpilars.

About the middle of May a large number of Pin cherry trees (*Prunus Pennsylvanica*) in High Park were found to be badly attacked by the Cherry Aphis (*Myzus cerasi*) the leaves at the ends of the branches being very much crumpled and disfigured. Subsequently they were found plentifully on the wild black cherry and also on the cultivated cherry.

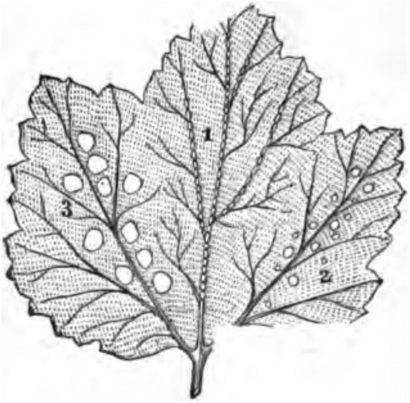


Fig. 28. Currant Saw-fly : leaf showing eggs and holes eaten by the young larvæ.

The Cabbage Butterfly (*Pieris rapae*) has been exceedingly abundant this summer and has caused a great deal of damage to cabbages and allied vegetables in this locality. On August 15, while inspecting a large market garden north of the city, the writer observed great numbers of the larvæ in all stages on a large bed of cabbages. They were to be found practically on every head, and many plants were quite unmarketable. An adjacent bed of cauliflowers was but little affected, though a few caterpillars were found on some of the heads. In another bed of cabbages only a few hundred yards distant from the one just referred to, the caterpillars were much fewer in numbers though plentiful enough.

The only other serious pest noticed attacking garden vegetables was the Potato Beetle (*Doryphora 10-lineata*, Say), which occurred in distressingly large numbers on potatoes, though tomatoes as far as the writer observed were pretty free from them.

An insect injurious to shrubs and shade-trees which seems to be on the increase lately is *Ormenis pruinosa*, a large stoutly-built leafhopper resembling a small bluish grey moth. I first noticed them in large numbers in 1901 on some shrubs which were planted in the spring of the same year. This year they were everywhere and showed themselves to be possessed of by no means a restricted appetite. While most abundant on the Virginia creeper and grapevine they were common on many other shrubs and trees, etc., such as the elm, maple, basswood, gooseberry, almond, Tartarian honeysuckle and rhubarb. The larvæ are whitish creatures not much like the adults in appearance, and have the habit of arranging themselves in irregular rows along the smaller branches and twigs, the whole aggregation being partly enveloped in a white flocculent material. The full-grown insects were first observed towards the end of July and remained until the beginning of October. Late in September they could be seen resting on the trunks of almost every shade tree except horse chestnuts, upon which they were very scarce and were probably accidental.

Among the insects which were abundant last year but have not been troublesome this season the Birch Bucculatrix (*Bucculatrix Canadensisella*) is noteworthy. The trees have been quite healthy the whole of this year, though in May I noticed that some of them were rather badly infested with a large species of aphid. Butterflies on the whole have been scarce according to the statements of local collectors, and two of our most destructive grasshoppers *Melanoplus atlanis* and *Camnula pellucida* were not nearly so numerous as usual, probably owing to the wet season, since both species thrive best in hot dry weather.

DIVISION NO. 5—LONDON DISTRICT. BY J. A. BALKWILL.

I am very happy to report that we have not had any insect visitations of a serious nature in this district during the past season.

Last winter my attention was called to some larvæ which were doing considerable injury to hay in barns in a part of London Township. They were so plentiful that I collected over 30 of them from a small handful of hay, and Mr. Moffat kindly identified them as the Dry Clover Moth (*Asopia costalis*), Fig. 29. By spinning their webs over the stems of the hay, they made it so unpleasant that horses and cattle did not care to eat it, and it thus caused a serious loss to those in whose barns it was found.

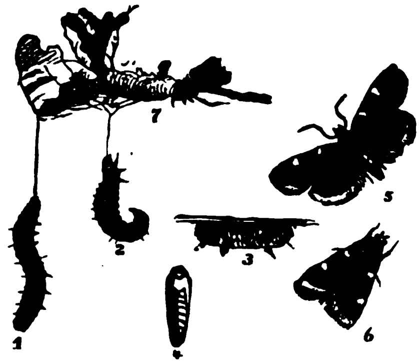


Fig. 29. Clover Moths, Caterpillars and Chrysalis.

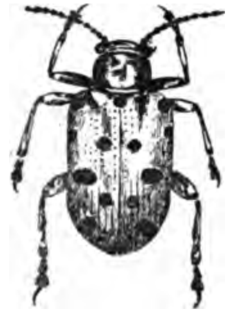


Fig. 30. 12-Spotted Asparagus Beetle (greatly magnified).

In August, during our Horticultural Society's Flower Show, Mr. Butler, St. George Street, London, asked me if I knew a beetle that attacked the asparagus; from his description I suspected that it was new, and therefore asked him to bring me some of them, which he did the next day. On shewing them to Dr. Bethune, who is always willing to oblige, he identified them as the Asparagus beetle *Crioceris 12-punctata* (Fig. 30). This, I think, is the first record of this insect for the London district.

The Codling Moth has not been as much in evidence this season as formerly, no doubt caused by the cold, wet weather, and this, I think, is the reason that insects in general have not been so plentiful as usual, mosquitoes excepted.

The Datana, which did so much injury to Black Walnut and Hickory trees last year, appeared again this season, but in very much smaller numbers, and the damage was very light.

The Buffalo Carpet Beetle (Fig. 31) has become a serious pest in this district, and causes great loss in carpets and other woollen articles. To give an idea of how plentiful they are, I may mention that on one bush of Spiræa in 5 days I collected over 100 beetles.

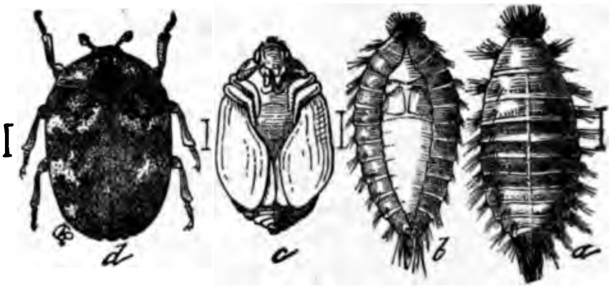


Fig. 31. Buffalo Beetle. *a*, larva (destructive stage) ; *b*, pupa within larval skin ; *c*, pupa ; *d*, beetle—all much magnified.

In the discussion which followed the reading of the Directors' reports, Prof. Lochhead remarked upon the progress of the Asparagus beetles. *Crioceris 12-punctata* (Fig. 30) had taken the lead of the other species, *C. asparagi* (Fig. 32), in their westward movement, while in the neighboring States the opposite was the case. Last year they had reached Guelph, the former species being much the more abundant, and now it alone had arrived at London. Dr. Fletcher stated that in the Niagara District both species were equally abundant, and he thought it remarkable that the 12-spotted beetle should have moved faster than the other. The asparagus rust he found very injurious last year at Ottawa, but this year there was very little of it. Mr. Balkwill had observed the same thing in gardens in London, where much injury had been caused by rust last year it was not noticeable this summer ; he also stated that the Codling Moth was very little in evidence in this neighborhood. Mr. Fisher asked how it was that the Codling Moth was so rare in the District referred to. Mr. Balkwill said that he could not account for it, as the owners of orchards had done no spraying. Mr. Fisher thought that the diminution in the numbers of the insect must have been caused by the small crop of fruit last year, which deprived it of a sufficient supply of food, and therefore prevented a large nnmber of the worms from attaining their maturity. He then asked what steps should be taken to control the Asparagus beetles. In reply it was stated that good results had followed from dusting the plants regularly with fresh lime when the larvæ were upon them.

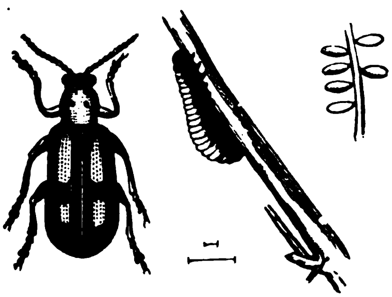


Fig. 32. Asparagus Beetle, larva and eggs.

Dr. Fletcher, in reference to the Codling Worm (Fig. 33) urged very strongly the importance of spraying during such a year as this, when their numbers were fewer than usual. We now had the enemy at its weakest, and could without much difficulty reduce its numbers to such an extent that it would take some time to become abundant again. Furthermore, good fruit brings a high price ; it pays well, therefore, to persevere in spraying. He considered that the reduction in the numbers of the insect was due to the cold, wet season, the small food supply and the extended use of spraying throughout the country. Among the enemies to this fruit, he mentioned the Apple-Weevil (*Anthonomus quadrigibbus*), Fig. 34, which he had found also in wild haws, and the Plum Curculio, which often attacks apples.

Mr. Fisher spoke of the best means of controlling the Codling moth ; he considered the bandage system the most effective of all, but the bandages must be removed at least every ten days and the bark beneath them scraped. If this is not done, the bandage proves the most convenient and safest place for the worm to change into a chrysalis, and thus far more harm than good is done. He strongly recommended three things—first, spray with Paris green during the first week after the blossoms have fallen, later than that is of no use ; second, bandage the trees and remove regularly ; third, keep hogs in the orchard to eat up the fallen fruit and thus destroy the worms contained in it.

Dr. Fletcher said that spraying, properly done, saved seventy-five per cent. of the fruit. East of Toronto there was only one brood of the Codling moth in the year and therefore bandaging the trees was of no use, but west of Toronto there were two broods per annum, the second being much the worst, and there bandaging produced excellent results. The bandages should be passed through a clothes-wringer which could be carried in a wheelbarrow from tree to tree, or they might be dipped into scalding water. The worms, however, will not all be found in the bandages, for about half of them burrow into the bark ; these can be got rid of by scraping with a wire brush which effectually tears them out of their burrows. He considered burlap or sacking the best material for the bandage and straw the very worst, because it is so hard to put on and makes such a litter in the orchard. One or two thicknesses of burlap, five or six inches in width, tied in the middle with a string, makes a satisfactory bandage. Hogs were very useful in the orchard to devour the fallen fruit. The moth did not lay her eggs till the fruit was about the size of a pea and continued laying till it was as large as a hickory nut ; during this period spraying should be done.

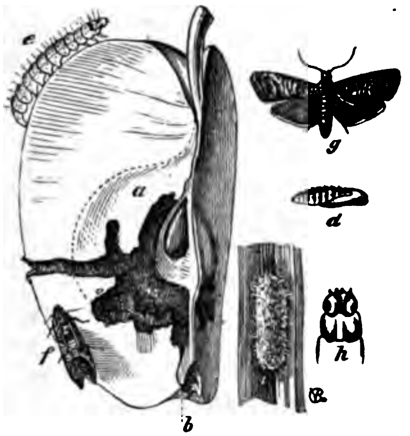


Fig. 33. Quarter of an Apple shewing the work of the Codling Worm ; the insect in all stages.

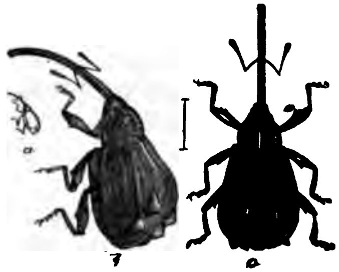


Fig. 34. Apple-Weevil (greatly magnified).

Mr. Fisher said that the calyx (at the tip of the young fruit) closes about a week after the blossom falls, and therefore it is necessary to spray early.

Prof. Lochhead found the Haseltine trap-lanterns perfectly worthless as regards the destruction of the Codling moth. They caught as many beneficial as injurious insects, but no Codling moths. " The Expansive Tree-protector" is all right in principle, as it is a bandage, but he found in nearly every instance that it was doing harm to the tree. The poisonous substance with which the felting is soaked was not effective ; the Codling larvæ were lively and active in it, also spiders and other insects which took advantage of the shelter. He had also found larvæ crawling over the sticky substance which was supposed to be a complete barrier against them. The worst feature about it is that it is said to expand automatically with the growth of the tree ; he found that it failed to do so, but gradually cut right into the wood through the bark and in time girdled the tree ; this could only be prevented by frequently opening and moving it. Sacking or burlap was ever so much better, as well as cheaper and simpler He was surprised to find how remarkably active the agents have been in selling these " protectors" ; they were to be seen in orchards all over the country.

Mr. Evans said that in his trap-lantern (described in the last Annual Report) he had caught a great variety of insects, but no Codling moths. They are evidently not attracted by light

Mr. Walter Smith related his experience with bandages, and said that the main cause of failure in their use is that people will not take the trouble to remove them regularly and then they become excellent hiding places for the worms.

Mr. Fisher found it a good plan to drive two nails into the tree and leave them there ; the string of the bandages could be twisted around them and released when the bandages were taken off in much less time than was required for tying and untying.

Mr. Balkwill spoke of the scarcity of clover seed this year, and wished to know whether this could be attributed to the destruction of the crop by the clover-seed weevil (*Phytonomus punctatus*) ; his own opinion was that the scanty supply of seed was due to the character of the season. The weather had been continuously cold and wet, so that the blossoms did not open and consequently the flowers were not fertilized.

Dr. Fletcher said that he had found the weevil abundant in British Columbia this year. Dr. Bethune stated that last year it was very numerous in London but this year he had not seen a single specimen.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1901-2.

The thirty-eighth annual meeting of the Society was held in London in November, 1901, and was well attended by members from a distance as well as those resident in the city. It was also favoured with the presence of the Hon. J. Dryden, Minister of Agriculture for Ontario, and Mr. G. C. Creelman, Superintendent of the Farmers' Institutes of Ontario. During the first afternoon a conference was held to discuss the progress, present aspect and future outlook of the San José scale in Ontario. In the evening a public meeting was held in the Normal School : the chair was taken by the Hon. J. Dryden, who delivered the opening address. The Rev Dr. Fyles then read his presidential address on "The Importance of Entomological Studies to the Community at Large," and illustrated his remarks with beautiful coloured diagrams, the work of his own hand. Dr. Fletcher followed with an address on "The Value of Nature Study in Education," and concluded with an exhibition of lantern slides of plants, insects and other natural objects of interest. The following day was occupied with the reading of papers and the reports of the officers, branches and sections of the Society.

The thirty-second Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in February last and was printed and distributed in the beginning of May. It contained 128 pages and was illustrated with three maps and fifty-eight figures in the text, a photogravure portrait of the late Miss Eleanor A. Ormerod and a very beautiful full-page plate of thirty-three varying specimens of *Hyphantria cunea* kindly contributed by Mr. Henry H. Lyman in illustration of his paper on "The North American Fall Web-worms." Besides the account of the conference on the San José scale and the proceedings at the annual meeting, the Report contained papers on the injurious insects of the year by Messrs. Young, Evans, Johnston, Lochhead and Moffat ; "The Painted Lady Butterfly" and the "Entomological Record for 1901," a new feature which is to be continued annually, by Dr. Fletcher ; "The trend of Insect diffusion in North America," the "Imported Willow and Poplar Curculio," and "The Common Cheese-mite living in Sporotrichum globuliferum," by Prof. F. M. Webster ; papers by Prof Lochhead on the "Hibernation of Insects" and "Nature study Lessons on Mosquitoes" ; by Mr. Moffat on "Anosia Archippus does not Hibernate" ; by Mr. Evans, on "Collecting at Light" ; Mr. Winn, on captures made at "The Milk-weed at Dusk" ; Mr. Walker, on "A Collecting Trip in South-Western Ontario" ; Mr. Gibson, on "A Day at the Mer Bleue." Dr. Fyles contributed a paper on "Crickets," and Mr. J. B. Williams, on "The Food of the Grass Snake." The volume closed with a report from the North-West (Canada) Entomological Society and obituary notices of the late Miss Ormerod and Mr. Otto Lugger.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 33rd volume was completed in December last; it consisted of 348 pages, illustrated with five full-page plates and eleven figures from original drawings. The contributors number sixty-two and represent Canada, the United States, England, Germany, Luxembourg and India. Of the 34th volume ten numbers have thus far been published; those for November and December will be duly issued at the beginning of their respective months.

During the greater part of the year meetings for the study of Entomology have been held on Tuesday evenings, followed during the summer months when the weather was favourable by collecting excursions on Saturday afternoons. The Geological Section has met regularly on Thursday evenings; the Ornithological once a month on Fridays; the Microscopical on alternate Saturdays during the winter and the Botanical during the summer and autumn. The reports of these Sections, giving a record of their proceedings, will be read at this meeting and be published in the next Annual Report of the Society.

The good work of the Society has been much extended by the delivery of popular lectures by several of the members. Dr. James Fletcher has given a large number on insects, noxious weeds and nature study in various places in Ontario, Quebec, the Maritime Provinces, Manitoba, the North-West Territories and British Columbia, in fact from one end of the Dominion to the other. Dr. Bethune has lectured, chiefly to school children and horticultural societies, in London and a number of towns not far distant, on noxious, interesting and beneficial insects. Mr. W. E. Saunders has addressed teachers and other assemblies in Montreal, Ottawa, London and elsewhere, on "The Birds of Canada." The Rev. Dr. Fyles has given popular lectures on Entomology in Quebec and Levis, P. Que.; and Prof. Lochhead has delivered lectures on entomological subjects in Guelph, Port Elgin, Owen Sound, Beeton, Woodstock and Hamilton.

All of which is respectfully submitted.

THOMAS W. FYLES, President.

REPORT OF THE MONTREAL BRANCH.

The 241st regular and 29th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held in the library of the Natural History Society, University street, on Tuesday evening, May 13th, 1902.

Owing to the absence of the President, due to illness, Mr. Charles Stevenson, Vice-President, occupied the chair.

The minutes of the last meeting were read, and minutes of last annual meeting taken a read and confirmed.

The Vice-President on behalf of the Council read the following report:

REPORT OF THE COUNCIL.

The Council takes pleasure in presenting the following report of the Society's work during the seasons 1901 to 1902:

Nine regular meeting have been held, the average attendance being seven.

Several field days were held, the principal ones being as follows :—

Point aux Trembles	1st June.
St. Martin Junction	15th "
Outremont	22nd "
St. Hilaire	1st July.

The following papers were read :

The Dissemination of Disease by Dipterous Insects	Charles Stevenson.
Curious Effects of the Attack of an Asilus Fly on *Colias Philodice*	A. F. Winn.
Is *Telea polyphemus* double brooded somewhere ?	Charles Stevenson.
On the Family of Flies called the Syrphidæ	G. Chagnon.
Eggs of *Tolype velleda*	A. F. Winn.
On collecting and preserving micro-lepidoptera	H. H. Lyman.
The Milkweed at dusk	A. F. Winn.
A new *Gortyna* and notes on the Genus	H. H. Lyman.
Coloration of Insects	Graeme M. Stewart, Toronto.
The Asilidæ or Robber Flies	G. Chagnon.
The North American Fall Web-worms	H. H. Lyman.
An Assam Danais and its mimics	Charles Stevenson.
An Hermaphrodite Lycæna	A. F. Winn.
An Introduction to the order Hemiptera	G. A. Moore.
Notes on *Eurosta solidaginis* Fitch	G. Chagnon.
Notes on *Lycæna Scudderii*	H. H. Lyman.
Lepidopterous Irisation	Charles Stevenson.
Remarks chiefly on Hydrœcias	A. F. Winn.

Our staff of members remains practically the same as last year.

Mr. A. E. Norris has kindly offered us room in his place of business to locate there our cabinet and collection. We must all offer to this gentlemen our sincere thanks for the kind assistance he has given us in this way.

Through the generous contribution of several of our members, our collection now amounts to probably 500 or 600 species which practically fill up the dozen drawers we bought at the beginning of the year.

An innovation introduced this year was the filing of all papers read at our meetings so to be accessible for future reference.

The report of the Treasurer will now be submitted to you, and also that of our Curator and Librarian who will give you many details as to the exact condition of our collection of insects.

Submitted on behalf of the Council.

(Signed) G. Chagnon,
President.

The Treasurer then submitted his report, showing a balance on hand of $47.52.

The Librarian and Curator then presented his reports showing that valuable contributions towards the collections of the Branch had been received ; from Mr. Winn 98 specimens of Lepidoptera and 134 specimens belonging to other orders, from Miss Emily L. Morton a very valuable donation of eight hybrids of her own rearing, from Mr. Chagnon 94 specimens of Diptera representing 51 species, from Mr. Norris 43 specimens of Lepidoptera, from Mr. Stevenson 20 specimens of butterflies, from Mr. Denny 13 specimens of butterflies. Mr. Beaulieu has promised a large number of specimens of Coleoptera and Mr. Lyman a number Western Lepidoptera.

The library is still of very modest proportions but the following additions have been made: Howard's "Insect Book," by purchase; "The Crambidæ of North America," by C. H. Fernald, A.M., Ph.D., presented by the author; "Annotated Catalogue of the Butterflies of New Hampshire," by Wm. F. Fiske, presented by C. M. Weed through H. H. Lyman.

It was then moved by Mr. A. Griffin, seconded by Mr. A. F. Winn, that the reports be received and adopted. Carried.

The Secretary then read the Annual Address of the President, after which the election of officers for the ensuing year took place with the following result: President, Charles Stevenson; Vice-President, A. E. Norris; Librarian and Curator, A. E. Norris; Secretary and Treasurer, G. A. Moore; Council, Henry H. Lyman, G. Chagnon, D. Brainerd.

On motion of Mr. Lyman, seconded by Mr. Griffin, the night for meetings was changed from the second to the first Tuesday in the month, as in the early years of the Branch.

On motion of Mr. Lyman, seconded by Mr. Winn, $5.00 was voted for the purchase of early volumes of *The Canadian Entomologist* for the Branch Library.

Messrs. Stevenson, Chagnon and Winn were elected a Field Day Committee.

Mr. Lyman then presented 55 specimens of Lepidoptera, chiefly western, for the Branch Cabinet.

Mr. Lyman read a paper entitled "What is a Genus?"

Mr. Norris then exhibited, with the help of Mr. Griffin and the lantern of the Natural History Society, a collection of excellent coloured slides of Lepidoptera.

On the adjournment of the meeting the members were entertained with refreshments by Mr. Griffin.

G. A. Moore,
Secretary.

REPORT OF THE QUEBEC BRANCH.

President's Report.

The Quebec Branch of the Entomological Society of Ontario has entered upon the sixth year of its existence.

We still have a goodly number of members though several of our young people have entered business houses and can no longer give attention to entomology. Some of our members have moved to distant parts of the country and some have been taken away by death. We here record with sorrow the demise of Miss Bella Thompson. After a long illness, borne with much patience and resignation, she departed this life on the 22nd of June last. The friends of this lady have our deep sympathy.

The weather during the past season has been remarkably variable—too cold and wet for insect life to flourish. We had, however, a very enjoyable field day on the 9th July at the Island of Orleans. But few insect captures were made, but some pleasant hours were spent in the grounds of Mr. and Mrs. Morgan and those of the Hon. R. and Mrs. Turner. On this occasion we found the oak trees infested with the Snout-beetle *Balaninus nasicus*, *Say*.

A specimen of the rare wasp, *Vespa rufa*, Linneus, was taken on the island, and a nest of *Vespa Germanica*, Fabr, was discovered there.

Vespa arenaria, Fabr, was abundant in the woods round Fort No. 2, Levis, in August; and *Pamphila Manitoba*, Scudder, was seen in the same month and in the same locality.

A tortoise beetle new to the province has appeared at Levis this year. It feeds upon the burdock and the Canadian thistle Specimens of this insect have been sent to the British Museum for identification.

REPORT OF COUNCIL.

The Branch now includes 32 members (24 adults and 8 juniors.)

The treasurer's report is submitted, and will no doubt be found satisfactory.

The continued rainy weather of last summer prevented the members from having many field-days but a very enjoyable one was held on the Island of Orleans on the 9th July.

Our thanks are due to the authorities of Morrin College for having continued to allow us the use of their rooms for our meetings.

CRAWFORD LINDSAY,
Sec-Treas.

The following were elected officers :—President, Rev. Dr. Fyles ; Vice-president, Miss E. MacDonald ; Council, Hon. R. Turner, Rev. F. G. Scott, Mrs. R. Turner, Miss Bickell, Miss Freeman ; Secretary-Treasurer, Lt.-Col. Crawford Lindsay.

REPORT OF THE TORONTO BRANCH

Of the Entomological Society of Ontario for the year 1901-2, ending April 30, 1902. Read at the Annual Meeting, held in the Education Department Building, May 16th, 1902. Mr. E. M. Walker, vice-president, in the chair.

GENTLEMEN :

During the past year ten meetings have been held, and the following papers have been read before the Society :—

" A Collecting Trip in South-western Ontario "	E. M. Walker.
" An Evening at the Milkweed "	A. F. Winn.
" Butterfly Collecting in 1901"	J. B. Williams.
" Some Interesting Lepidopterous Larval Habits"	Arthur Gibson.
" The Canadian Stick Insect"	J. B. Williams.
" On Crickets "	E. M. Walker.

Two meetings were occupied with the "Exhibition of Specimens," and at the special meeting in November addresses were given by Mr. Arthur Gibson and Dr. Fletcher, of Ottawa, and by Mr. H. H. Lyman, of Montreal, these gentlemen having kindly arranged to be present on their way back from the London meetings. A number of the Natural History Society members came to this meeting, as well as those of our own Branch, and a very pleasant evening was spent in listening to and conversing with our three visitors.

We arranged for a Field Day to High Park on the 24th of May, 1901, but, unfortunately, the weather made any expedition of this kind impossible ; however, we subsequently went to High Park for the afternoon of June 22nd, and had an interesting and successful afternoon.

A number of additional drawers in the Education Department museum have been corked and glazed for the collection of insects that the Society is making for the Department, and we have now plenty of space to re-arrange the collection in a satisfactory manner, and provide room for all the orders.

The Orthoptera, Odonata and diurnal Lepidoptera have already been re-arranged.

We have subscribed for the " Journal of the New York Entomological Society," the " Entomological News" and the " Bulletins of the New York State Museum.".

The Branch presented a series of the very beautiful plates of scale insects, from Bulletin No. 46, to the Education Department museum, and Mr. Boyle, the Superintendent of the museum, has had them framed and hung up in one of the rooms.

Valuable papers on entomological subjects have also been received from the Central Experimental Farm at Ottawa, the United States Department of Agriculture at Washington, and from several other sources.

The attendance at our meetings is but small, and we have only added one new name to our membership during the year. Most societies of this kind, however, have their "ups and downs," and we must hope that by next year we shall be able to report that the attendance and membership are going up.

E. M. Walker, Vice-President.
J. B. Williams, Sec-Treasurer.

Toronto, May 16th, 1902.

The following officers were elected for the present year :—President, E. M. Walker ; Vice-President, G. M. Stewart ; Secretary-Treasurer, J. B. Williams ; Librarian and Curator, J. H. Webb ; Members of Council, Arthur Gibson, John Maughan, jr.

REPORT OF THE TREASURER.

Financial Statement of the Treasurer of the Entomological Society of Ontario for the year ending August 31st, 1902.

Receipts.		Expenditure.	
Balance from previous year	$ 483 05	Printing	$ 731 34
Members' fees	388 22	Expense, Annual Meeting & Reports	270 97
Government Grant	1,000 00	Salaries	375 00
Proceeds from sales, Pins, Cork, &c	14 23	Rent	165 00
Proceeds from sales, Entomologist	130 25	Library	36 98
Advertising	28 43	Expense—sundry	66 03
Interest	15 32	Balance	414 18
Total	$2,059 50	Total	$2,059 50

Auditors : { W. H. Hamilton.
J. A. Balkwill.

Treasurer :
Jas. H. Bowman.

REPORT OF THE LIBRARIAN AND CURATOR.

For the Year Ending 31st of August, 1902.

38 volumes were added to the Library during the year, made up as follows :—

Twenty-one bound volumes of Government Reports, Proceedings and Transactions of Scientific Societies, Institutions, &c., the most important of which is, the 21st Annual Report of the U. S. Geological Survey for the Years 1899 & 1900, in seven large volumes, profusely illustrated, with maps, and accompanying them was, the Geological and Mineral Resources of the Copper River District, Alaska ; also, Reconnaïssances in Cape Nome and Norton Bay Regions, Alaska, 1901.

By purchase : The three first volumes of the Lepidoptera Phalænæ in the British Museum, with plates. By Sir George F. Hampson, Bart.

By exchange : The first two volumes of British Lepidoptera. By J. W. Tutt, F.E.S. Twelve volumes were bound, bringing the total number of volumes now on the Register up to 1,760.

41 books were issued to local members during the year.

Some valuable additions were made to the Society's native collection ; and several rare and interesting specimens were secured in this locality, whilst some indicate the spread of injurious species.

Respectfully submitted.

J. Alston Moffat.

REPORT OF THE BOTANICAL SECTION.

The Botanical Section met for organization on 31st May, when the following officers were elected for the year 1902:—Chairman, Rev. Dr. Bethune; Vice-Chairman, J. Dearness; Secretary, J. A. Balkwill.

The attendance at the meetings, which were held every second week, was very good, and a considerable interest has been maintained during the season.

An outing to Thompson's bog was held on July 11th, but, owing to the wet weather, only a small number attended. The bog was overflowed with water, and many parts could not be visited. A number of interesting plants were brought home, but no new plants were discovered.

Mr. J. H. Bowman reported an outing by Rev. T. C. Scott and himself, when the following fungi were gathered, cooked and eaten: *Cantharellus cebarius*, *Russula heterophylla*, *Psaliota placomyces*, *Lycoperdon cyathiforme*; also having seen a very large *Amanita muscaria*, with a number of dead insects near by, killed by eating the poisonous mushroom.

During the season a large number of plants were brought to the meetings, examined and identified.

J. A. Balkwill,
Secretary.

REPORT OF THE MICROSCOPICAL SECTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Microscopical Section of the Entomological Society of Ontario takes pleasure in presenting its twelfth annual report.

Since the last annual report five new members have been added to the membership roll of the Section, namely: Messrs. C. W. Horton, G. Escott, N. Beal, J. Tanton and C. Parsons.

The re-organization meeting was held on the Twenty-eighth of September, 1901, when the following officers were elected:—

Prof. Jas. H. Bowman	Chairman.
Prof. J. Dearness	Vice-Chairman.
Mr. E. A. Brown	Secretary.
Profs. Bowman & Dearness and Mr. C. W. Horton	Executive Committee.

During the past winter (the Microscopical Section resolves into the Botanical Section during the summer months) sixteen regular meetings were held, with an average of ten members, as well as visitors. At the request of the Students of the Western University, a number of the members of the section assisted in the programme at the annual Conversazione. In addition to the exhibition of a number of the slides in the Society's collection, Prof. Dearness demonstrated "Life in a Drop of Water" and "Circulation of Blood;" Dr. Bethune exhibited a number of slides of Insects or their parts, while Prof. Bowman prepared Crystals on the spot and, by means of the polariscope, brought out their beautiful colors.

From time to time throughout the season papers were read or addresses given on the following subjects:—

Pond Life	Prof. Bowman.
How Best to Mount Seeds for Microscopic Examination	Prof. Dearness.
On the Theory of Colored Light Rays	Prof. Bowman.
How Best to Mount Sections of Cloth	Prof. Bowman.
On Sertularia	E. A. Brown.

Microscopic Examination of Plant Hairs	Prof. Bowman.
On the Wet Mounting of Pollen	Prof. Dearness.
On the Dissimilarity of the Muscular Tissue of an Insect and a Higher Animal	Prof. Dearness.
Mono-bromide of Camphor Crystals and Methods of Making and Mounting	Prof. Bowman.
Notes on the Life History of Trichina Spiralis	Prof. Dearness.
Practical Study of Branchippus, Cyclops and Cyprus	Prof. Bowman.
Properties of the New Metal Radium	Dr. Bethune.
The Respiration of Spirigæ	Mr. R. W. Rennie.
On the Local Distribution of Riccia Natans	Prof. Bowman.
On the Way in Which Riccia Natans Passes the Winter	Mr. R. W. Rennie.

In addition to the above papers, the members exhibited many beautiful slides of crystals, sections of wood and insects.

At one of the meetings Mr. Law drew the attention of the Section to the difference in composition of specimens of sand from Santa Pensacola (Florida) and Sable Island. The granules of the former were sharply cut, of a whitish color, making beautiful polariscopic objects, while the latter were found to be composed of Silica stained by the action of some metallic oxide and presented a rounded appearance. Dr. C. Abbott, who for some time has been conducting experiments in Micro-photography, exhibited some interesting and instructive photographs, which go to show the advantages to be derived from the union of the Microscope and the Camera.

It is the earnest desire of each member that, during the near future, there may be a large increase in the ranks not only of this Section, but of all societies that have for their motive the advancement of science, for the field of observation and study is large, while as yet the laborers are comparatively few in number.

All which is respectfully submitted.

Jas. H. Bowman,
Chairman.

Edgar A. Brown,
Secretary.

REPORT OF THE ORNITHOLOGICAL SECTION.

During the year just past the Ornithological Section has held nine regular meetings at which the attendance has averaged over six.

At these meetings many interesting subjects have been brought up and discussed and many valuable notes recorded. One bird new to Canada was reported, viz. the White-eyed Vireo, by W. D. Hobson, Woodstock ; and two others, the King Rail and the American Scoter, which are new to the County of Middlesex, were also noted.

Two Mammals new to this district were also recorded by Mr. Robert Elliott: an undetermined Lemming and the Pine Mouse. Specimens of these were shown at one of the meetings and they were stated by Mr. Elliott to be common, though no one else had succeeded in taking any.

Three families of birds, the Vireos, Swallows and Warblers, have been studied at the meetings and twelve papers have been read ; two of these were published in "The Auk" and most of the others have been or will be published in "The Ottawa Naturalist." These papers were as follows :

"The Bobolink's love for its home"; "The Prairie Horned Lark nesting in New Brunswick"; and "a Hybrid between the Sheep and the Deer," by Wm. H. Moore, Scotch Lake, N. B.

"The American Scoter in Middlesex County;" "Nesting habits of the Ipswich Sparrow"; "The spots on the eggs of the Great Blue Heron;" "Early Nesting in 1902," by W. E. Saunders, London.

"The Cardinal an established resident of Ontario," and "Cubic contents of the eggs of the Buteos." by J. E. Keays, London.

"Recollections of the Passenger Pigeon," by Dr. Bethune, London,

"The Parula Warbler and its variety," by Robert Elliott, Bryanston.

"The White-eyed Vireo at Woodstock," by W. D. Hobson, Woodstock.

Work has been continued on the list of the birds of Middlesex, which is not yet completed, and the migrations of birds have been studied during their progress as usual.

Since our last report was made, addresses and lectures have been delivered by our members as follows : to audiences in Sarnia, Toronto and Brantford ; before the Field Naturalists' Clubs of Ottawa and Guelph ; and in London to one assembly of Teachers, two Farmers' meetings and four Church associations.

All which is respectfully submitted.

W. E. SAUNDERS,
Secretary.

Mr. Saunders exhibited specimens of the Lemming referred to in the foregoing report and also of several species of Mice. Prof. Lochhead remarked that the Ornithological Section was performing a very good work, especially by the popular lectures on Birds that were given by some of the members. He noticed that a great interest had been thus awakened at Guelph and would he was sure be long maintained.

REPORT OF THE GEOLOGICAL SECTION.

The Section continued its weekly meetings as heretofore, studies of geological specimens and addresses on geological subjects furnished instruction for the members of the section. A new and most successful feature of the year's studies was a monthly meeting for blow pipe analysis of various minerals. This department was in charge of Messrs. Dempster and Smith. Dr. W. J. Stevenson also gave a most instructive lecture on the tests for a number of minerals by wet assaying. Visits were made to places of interest, as has been the custom in past years. Dr. Woolverton visited the neighborhood of the Sandhills of the Sauble, and discovered a new outcrop of the Hamilton series in that vicinity. Mr. Percival visited the glacial markings on Kelley's Island. Mr Smith the Rainy River and other North West Ontario districts. Besides these reports made by our own members, interesting descriptions of Temiscaming district were given by Mr. Geo. Taylor, and the Atlin, British Columbia by a resident mine owner of that northern region.

Dr. Woolverton kept the table supplied with numerous interesting specimens to illustrate the papers read.

Articles on geological subjects were read by different members of the section.

Dr. Woolverton's report on the Sandhills of the Sauble summarized was as follows. The sands blown from the beach form hills of a considerable height. The width of district covered by these dunes is about 2 miles. On the edge of the sand ridges a fossil bed of the Hamilton period was observed ; numerous specimen of *Zaphrentis prolifica* were visible.

MR. PERCIVAL'S REPORT ON the GLACIAL MARKINGS OF KELLEY'S ISLAND.

Kelley's Island is situated in Lake Erie off the north coast of Ohio. The glacial groove is situated at the north end of the island in the limestone rocks of the district. The portion of the groove preserved is 33 ft. across and apparently 17 ft. deep. The groove presents a series of corrugations merging into each other by beautiful curves. The whole appearance is that of Corinthian columns lying prostrate side by side. On what is known as "Inscription Rock" are sculptures made evidently by the Indians in times long past. The figures denote historical events of deep interest, relating to the conquest of the island by the Iroquois. These sculptures, found on the south side of the Island, were deeply engraved and though now rapidly weathering away, are yet easily traceable.

MR. SMITH'S REPORT ON THE EAGLE LAKE MINING REGION.

The Eagle Lake District is reached by C. P. R. from Fort William and lies some forty miles east of Rat Portage. Eagle Lake, about where the group of mines and prospects comprising the mining division are located, is some 90 miles in length and ranges from 1 to 13 miles wide. The course of the lake is very tortuous and many islands are met with. The scenery presented by the sheets of pure blue water, granite bluffs and evergreen blanketed hills is of a degree of picturesqueness not soon to be forgotten.

The distributing point of the lake is at Vermilion Bay, a small C. P. R. by-station consisting of half a dozen buildings and shacks. There is another C. P. R. station known as Eagle River on a river of that name tributary to the lake. At the north end of the lake proper a Hudson Bay post is located. A few trappers, prospectors and Indians are the only other representatives of human kind in that great region. The Provincial Department of Crown Lands has surveyed the country sufficiently to make known in a general way the configuration of the lake, but the details of the topography and geology of the land about it are still generally unknown.

It is agreed among students of the subject that what is now known as the "Height of Land" extending through Quebec, Northern Ontario and Keewatin in the form of a horse-shoe reached an altitude rivally that of the Appalachian system which gives shape and position to the eastern half of this continent. Owing to changes of rainfall and temperature, a great tract which centres about the Height of Land came under a thick cap of snow and ice which, in its movements, ground down the hills, filled the valleys and scooped hollows which filling with water became lakes. This theory, which has been very briefly and inadequately put, accounts for the larger features as well as for many of the minor phenomena which characterize our great Northland.

It is the theory of the writer that Eagle Lake owes its existence to a branch of the great Keewatin Glacier, which formed west of Hudson's Bay and several hundred miles due north of the lake.

A careful study of the map indicates that the branch referred to passed in a general south-easterly direction sending lateral divisions to the north-east and south-east. The northern shores of the lake are generally destitute of soil which may be accounted for by the comparatively recent retirement of the glaciers and to water erosion facilitated by the heavy rainfall and the undulating character of land.

A number of rocks picked up by the writer were found to consist of specimens of basic gray granite, red granite, talcose hornblende schists of a green color and black trap.

The gray granite was found 100 feet from the surface. It was overlaid by the red variety which in turn gave place to the green schist. The eruptive rock was found on an island facing the granite and schist outcrop. The formation of the granite in the outcrop was anticlinal *i. e.* tipped upwards from the lake, while the schist layers above appeared to dip in the reverse direction. The basic granite shows clear indications of decomposition in exposed parts where the felspar is broken down into kaolin giving the rocks a whitish cast.

At many points are to be seen the outcrops of quartz veins found either as stringers or as a single vein (which may be two or three feet wide.) When the quartz is in stringers the filling matter is green schist, similar to that before mentioned. The quartz carries small per-centages of mineral *i. e.* magnetite or black sand, copper and iron pyrites, zinc blende and native gold and silver. By pulverizing the quartz in a mortar and panning, the operator will frequently obtain colors (or minute specks of pure flour gold) in these veins. From a number of them there have been taken near the surface splendid specimens of free gold; some small samples, running as high as fifteen or twenty dollars in gold values, of this kind do not, however appear to obtain at the greater depths.

When the gold is found in a network of fine stringers a disproportionate body of barren matter must be excavated at great expense in order to procure the rock carrying gold. Two miners working in a tunnel are able to take out about a ton per day.

When the quartz-vein is compact, the prospector looks for values on the side adjacent to the foot wall. Assuming the average value per ton to be the same in each case it is obvious that the latter class of prospect could be operated much more economically than the stringer-quartz prospect. In the former the barren material may be left untouched except in so far as its removal may be necessary in the construction of passages. The pay ore may be kept freer of extraneous material involving less cost in transporting and milling. The labor of sorting is also eliminated.

The majority of the prospect mines of the region are as yet prospect claims only. They have for the most part been staked by miners and prospectors of the district who have not the funds wherewith to carry on their work continuously until conclusive results are reached.

If the district is ever to produce gold in paying quantities, capital must be invested there but subject to conditions. If a mine is capitalized to a greater extent than is reasonably necessary to pay expenses for the period during which it is decided to work it, there is usually a great temptation on the part of directors and managers to spend the company funds too lavishly. In the second place if the mine ever pays, its earnings must be divided among a greater number of shares than would be the case if the capital had been less, thus giving smaller dividends. Then the management of such mines must be put in the hands of capable and experienced men, who know all branches of their work thoroughly. Again, operations should at first be carried on on an exceedingly modest scale in order that, if no result obtains, the loss may be at a minimum. Investors may thus feel their way to greater expenditures of money. Most of the prospects contain only a very low grade of ore, so that all machinery introduced should be on that basis.

Summing up it appears to be only necessary for companies forming or about to form with the object of exploiting the region to capitalize moderately, engage trained and efficient men as foremen and superintendents, and to operate on a wholly conservative basis. The district may then become a regular contributor to the gold output of this country.

All which is respectfully submitted

GEORGE B. KIRK,
Chairman.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

(THROUGH THE REV. C. J. S. BETHUNE, D. C. L., DELEGATE.)

The Entomological Society of Ontario has now completed its thirty-eighth year and continues to perform good work of a practical and scientific character. Its membership maintains a steady growth and there is a frequent demand for complete sets of its publications from various parts of the world. Its monthly magazine and annual reports contain the records of so much original research and investigation that they have become essential to the equipment of every student in this department of natural science.

During the greater part of the year regular meetings have been held in the Society's room at London. On Tuesday evenings several young men have met for the systematic study of insects under the guidance of Dr. Bethune and Mr. Moffat; on Thursdays the Geological Section has continued, with unabated enthusiasm, to discuss the rocks and minerals of the surrounding country; on alternate Saturdays the Microscopical Section has met throughout the winter to investigate the hidden things of nature and study the beautiful forms which cannot be seen with the unaided eye. Once a month, on Fridays, the Ornithological Section, has gathered together at the house of Mr. W. E. Saunders; the numerous papers by its members, published in the *Ottawa Naturalist*, testify to the energy and zeal with which they have devoted themselves to the study of bird life. During the summer the Botanical Section took the place of the Microscopical and held many interesting meetings. One field excursion only was made to Komoka, a favourite collecting ground near London; it was thoroughly enjoyed by the few botanists and entomologists who attended.

The Branches of the Society at Montreal and Quebec, the former of which has flourished for twenty-eight years, report that they have had a very satisfactory season, regular meetings have been held and many excellent and interesting papers were presented; a few field days have also been found very enjoyable and have helped much in stimulating the ardour of those who attend them. The Toronto Branch, like that at Quebec, is now five years old, but it has not received nearly so much encouragement and support as its twin-sister in the lower Province. Why the "Queen City of the West" should furnish so few entomologist is difficult to understand; it has the advantage of many distinguished seats of learning, several extensive libraries, a number of scientific Professors, and a rich and easily accessible country for exploration. Notwithstanding their limited numbers, the members of the Branch have held frequent meetings, at which several excellent papers were read, and have made good progress in the formation of a collection of insects for the Ontario Department of Education.

A noteworthy feature of the Society's work is the delivery of popular lectures by competent members. Dr. James Fletcher has given a large number on insects, noxious weeds and nature study, in various places in Ontario, Manitoba, the North West Territories and British Columbia; Dr. Bethune has lectured, chiefly to school children and Horticultural Societies, in London and a number of towns not far distant, on noxious, interesting and beneficial insects; and Mr. W. E. Saunders has addressed teachers and other assemblies in Montreal, Ottawa and other places as well as in London, on the Birds of Canada. These lectures have been well attended and listened to with great interest, and will evidently do much to awaken and stimulate a love for natural history and a desire to know more about the wonders in plant and animal life that everywhere surround us.

The thirty-eighth annual meeting of the Society was held in London in November last, and was attended by the Hon. J. Dryden, Minister of Agriculture for Ontario, and a number of members from different places. The proceedings opened with a discussion on the San José scale, its ravages in Ontario and the best methods of keeping if under control; much useful information was given by Mr. G. E. Fisher, Provincial Inspector of Scale insects, Dr. Fletcher the Dominion Entomologist and Professor Webster, State Entomologist of Ohio. An evening meeting, to which the public were invited, was held in the Normal School building; the Hon. J. Dryden took the chair and gave the opening address, in the course of which he said that the Entomological Society was one of the best as well as the oldest of the associations aided by the Government of Ontario, that "we need its accurate work and we have been greatly aided and helped by it during all the nearly forty years of its existence, and no doubt shall continue to be helped by it during the years to come". The Rev Dr. Fyles, of Quebec, the President of the Society, gave an address on "The importance of Entomological Studies to the community at large", illustrating his remarks with a beautifully executed series of diagrams, the work of his own hand. He was followed by Dr. Fletcher, who spoke on "The value of nature study in

Education" and concluded with an exhibition of lantern slides of plants, insects and other natural objects. During the remaining session a number of valuable practical and scientific papers were read, these are published, together with the reports of the Officers, Branches and Sections of the Society, in the 32nd Annual Report recently issued by the Ontario Department of Agriculture.

This volume of 128 pages is illustrated with two plates, a portrait of the late Miss Eleanor A. Ormerod, and a series of figures of the Moth *Hyphantria cunea*, three maps and fifty-eight wood cuts in the text. The principal articles are papers on the Insects of the year 1901 by the Directors, Messrs. Young, Evans and Johnston, and by Professor Lochhead and Mr. J. A. Moffat. "The Painted Lady Butterfly (*Pyrameis Cardui*)" and the "Entomological Record," a new and highly important feature, which is to be continued annually, by Dr. James Fletcher. "The North American Fall Web worms," illustrated by the beautiful plate already referred to, by Mr. Henry H. Lyman. "The trend of Insect diffusion in North America", the "Imported Willow and Poplar Curculio," and a singular case of a Cheese mite living in the culture intended for the destruction of the Chinch-bug, by Professor F. M. Webster. Two useful papers by Prof. Lochhead on the "Hibernation of Insects" and "Nature Study Lessons on the Mosquito". A paper by Mr. J. Alston Moffat setting forth his reasons for believing that the Archippus butterfly, whose habits he has studied for many years, does not hibernate. Interesting papers on collecting and field work: by Mr. Evans on the attractive powers of an electric lamp; Mr. Winn on his wonderful captures at a clump of milk-weed at dusk; Mr. Walker on "A collecting trip in South-western Ontario," and Mr. Gibson on "A day at the Mer Bleue." Dr. Fyles contributes a paper on "Crickets"; Mr. Stevenson on "Commercial Entomology", and Mr. Williams on "The Food of the Grass Snake," which he finds to be Cut-worms. The volume closes with a report from the North-west (Canada) Entomological Society, by Mr. Gregson; and obituary notices of the late Miss Ormerod and Mr. Otto Lugger, by the Editor.

"The Canadian Entomologist," the monthly magazine of the Society, is now in its 34th year of publication. The volume for 1901 contains 348 pages, and is illustrated with five full page plates and eleven figures from original drawings. The contributors number sixty-two, and represent Canada, the United States, England, Germany, Luxembourg and India. The principal articles may be classified as follows; Descriptions of new genera, species and varieties in Lepidoptera by Messrs. H. H. Lyman, A. G. Weeks, A. Busck and Dr. Wm. Barnes; Orthoptera by Dr. S. H. Scudder, Prof. A. P. Morse and Mr. A. N. Caudell; Hemiptera by Mr. E. D. Ball and Prof. H. Osborn; Diptera by Prof. T. D. A. Cockerell, Messrs. C. Robertson and D. W. Coquillett; Coleoptera by Prof. H. F. Wickham and Mr. H. C. Fall; Hymenoptera by Messrs. E. S. G. Titus, W. H. Ashmead, T. D. A. Cockerell and C. Robertson; Neuroptera by Mr. N. Banks; and Homoptera (Hemiptera) by Messrs. G. B. King and T. D. A. Cockerell. Eleven new genera and sub genera are described and 123 new species and varieties.

Papers on Classification and Systematic Entomology: Ontario Acrididæ by Mr. F. M. Walker; lists of Lepidoptera from Alberta by Mr. Wolley Dod, from Southern Manitoba by Mr. E. F. Heath; the Moths of Manitoba by Mr. A. W. Hanham and the Butterflies of Nebraska by Mr. M. Cary; Cicadidæ by Dr. A. D. McGillivray; the Genera and species of Coccidæ by Professor Cockerell; the Genus Catocala by Professor G. H. French and Mr. O. C. Poling; Spilosoma congrua by Mr. H. H. Lyman; Generic names in Orthoptera by Mr. J. A. G. Rehn; discussions of Lepidoptera by Dr. H. G. Dyar, Prof. J. B. Smith and Prof. J. R. Grote; Staphylinidæ by Dr. E. Wasmann; Coccidæ by Mr. G. B. King; Collecting Notes on Kansas Coleoptera by Mr. W. Knaus; American Bees by the Rev. T. B. Morice and Professor Cockerell; The Genus Osmia by Mr. E. S. G Titus; the Respiration of Aleurodes by Prof. C. W. Woodworth; the Xiphidiini of the Pacific Coast by Prof. A. P. Morse; Note on Bæus by Mr. W. H. Harrington.

Life histories of the following insects are given ; Xylina Bethunei by Mr. Lyman ; several species of Hydræcia by Mr. H. Bird ; the Green-house Leaf-tyer by Dr. Fletcher and Mr. A. Gibson ; the fall Canker-worm by Mr. D. E. Hinds ; several species of Catocala by Messrs. G. M. and E. A. Dodge ; Nannothemis bella by Mr. R. Weith and Prof. J. G. Needham ; and Arctia virguncula by Mr. Arthur Gibson.

In Economic Entomology there are important papers by Mr. E. D. Sanderson on Plant-lice affecting Peas, Clover and Lettuce ; Diptera bred from Cow manure by Dr. L. O. Howard ; the Exportation and Importation of Beneficial Insects by Prof. F. M. Webster ; the Insect Fauna of Human Excrement (a review) by Dr. J. Fletcher. Also a paper on the effects of Scorpion venom by Mr. O. W. Barrett.

NOTES ON THE SEASON OF 1902. (WESTERN QUEBEC.)*

By Charles Stevenson, Montreal.

The season commenced early with every prospect of a good time for the Insect-hunter, but the meteorological conditions soon became of such a nature that there was little sport for the Lepidopterist. The temperature was low with high winds and perpetual rains. However, on the 22nd June, when at Piedmont in the Laurentian Hills, I had the pleasure of adding a new species of butterfly to the Quebec list, which was identified by Mr. H. H. Lyman as *Coenonympha inornata* Edw. The day was anything but favorable for collecting, as there was no sunshine and several showers. But on a plateau at a high elevation behind "La Montagne," I caught five perfect specimens in twenty minutes time. On returning to the station I found that Mr. A. E. Norris who had gone off in another direction had caught a weather-beaten specimen. This insect has been recorded in Newfoundland, Labrador, Sault Ste. Marie and Lake Winnipeg in Canada, Montana and Minnesota in the United States. Dr. W. J. Holland, who possesses a large series of this species, says that the Newfoundland type is distinctly darker than those in the Northwest. Four of my captures are pale and one dark. By this capture in the Laurentians it seems probable that its range extends across the continent on the high grounds unfrequented by the Entomologist, and as these regions open up it may prove to be found fairly abundant from Labrador by the Laurentians, along the north shore of the Ottawa on to Lake Winnipeg and into the United States.

At the same place and date while grubbing among rotten stumps I found an interesting looking larva which was successfully reared to maturity, producing a fine specimen of a click-beetle, rare to us, *Pityobius anguinus* Lec. This calls to mind the capture of a very large Eyed-elater, *Alaus oculatus* Linn (Fig. 35) on the slopes of Mount Royal on the somewhat early date of the 18th May, resting on the trunk of a fallen tree.

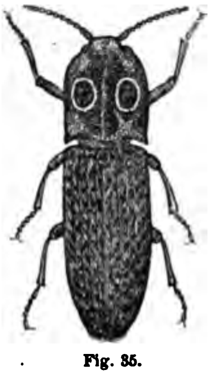


Fig. 35.

When the Natural History Society visited Piedmont on the 7th June, a day of rain and drizzle, a few of us enthusiasts braved the elements and I was fortunate enough to get a syrphid fly new to the very fine collection of Mr. G. Chagnon and a moth *Mamestra latex*, Gn. new to mine.

A specimen of the Hag-moth *Phobetron pithecium* A. & S. was obtained in sweepings on Mont Beloeil at St. Hilaire on the 9th July.

In the Coleoptera my last captures were :

Galerita janus, Fab., 25th May, Rigaud, Que.

Callida punctata, Lec., 9th July, St. Hilaire, Que.

Cychrus viduus, Dej., 11th July, St. Hilaire, Que.

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* Read before the Montreal Branch of the Entomological Society of Ontario.

One specimen was found by Mr. G. Chagnon and two by myself, the reward of an afternoon's scraping among dead leaves and rubbish.

Saperda mutica Say., 19th July, Chambly Co., Que.

Neoclytus erythrocephalus Fab., 11th July, St. Hilaire.

Long-horns were very scarce throughout the season with the exception of *Typocerus velutinus* Oliv., which was quite plentiful.

Platydema ruficorne Sturm, was very abundant in Laval Co. on the 11th May, when Mr. Chagnon and myself obtained over 150 specimens between us in a quarter of an hour.

Two weevils that live on water plants *Lixus rubellus* Rand, and *Lixellus filiformis* Lec., were captured while boating on the lake at Mont Beloeil, St. Hilaire, on the 9th July.

While rearing some *Osmoderma eremicola* larvæ I found that the attractive "Nimble fly," *Zelia vertebrata* Say., is its parasite.

The beautiful Crane-fly *Bittacomorpha clavipes* Fab., was very abundant along the banks of a stream running through the village of St. Hilaire, on the 11th July.

Specimens of the "micropterous" variety of the Chinch-bug *Blissus leucopterus* Say., were found at Rigaud on the 24th May and on Montreal Island during July.

Lepidopterous larvæ were somewhat scarce, especially such ones as the Tent-caterpillars *Clisiocampa americana* Fab., and the Tentless *C. disstria* Hbn. At St. Hilaire the water hemlock borers *Gortyna marginidens*, were plentiful, but those of the burdock *G. rutila*, usually so common on Montreal Island, were fewer than in former years, and Cut-worms have not been prominent. But the Tussock-moth caterpillar is spreading among the shade trees of Montreal to a dangerous extent, and it is to be hoped that the citizens will awaken to the fact, before it is too late.

NOTES ON THE SEASON OF 1902.

By J. Alston Moffat, London, Ont.

To the collector of natural history specimens, the weather is of the first importance ; and in no other of the departments of natural history is the collector made to realize the close dependence there exists between the weather and success, than in botany and entomology, whilst entomology seems to be the more sensitive to adverse influences of the two. Hence, a cool, wet summer, although it will produce luxuriant vegetation generally, may, nevertheless, place Paris Green and Bordeaux mixture at a discount.

Perhaps never in the history of his career, has that antiquated subject of reference, "the oldest inhabitant," so completely failed to recall from the dim and distant past, a summer to correspond with that of 1902 in this locality, for uniform coolness and frequent rains, and its natural compensation, a general reduction in the number of insect pests. To the Entomological collector the season may be pronounced a complete failure. During a ramble in quest of specimens, he might see the landscape adorned with flowers, and yet find no butterflies there to give animation to the scene. But as has often been observed amidst a general scarcity, some unusually good finds have been made.

Four years ago Mr. Bice secured a specimen of that rare Sphingid *Deidamia inscripta*, Harr, which he generously donated to the society's collection, the only representative of the species yet there ; but early this season he took another in his own house, whilst yet another was taken by Mr. J. Tanton in a different part of the city—a notable incident in so rare a species. Mr. Bice also took a fresh specimen in perfect condition, of that attractive *Sphingid* which is rarely met with here, *Ampelophaga versicolor*, Harr.

That large and attractive southern butterfly, *Papilio cresphontes*, Cram. Fig. 36, was more frequently seen and larger numbers of it taken than for many years back ; which seems rather strange, considering the character of the season.

That singular looking *Hemipteron Ploiaria brevipennis*, Say. *Emesa longipes*, Fab., whose appearance suggests a componnd between the Mantis and Walking-stick ; has been more frequently observed, and more interest taken in it, and enquiries made about it than ever before, some fine specimens of it having been brought to me for determination.

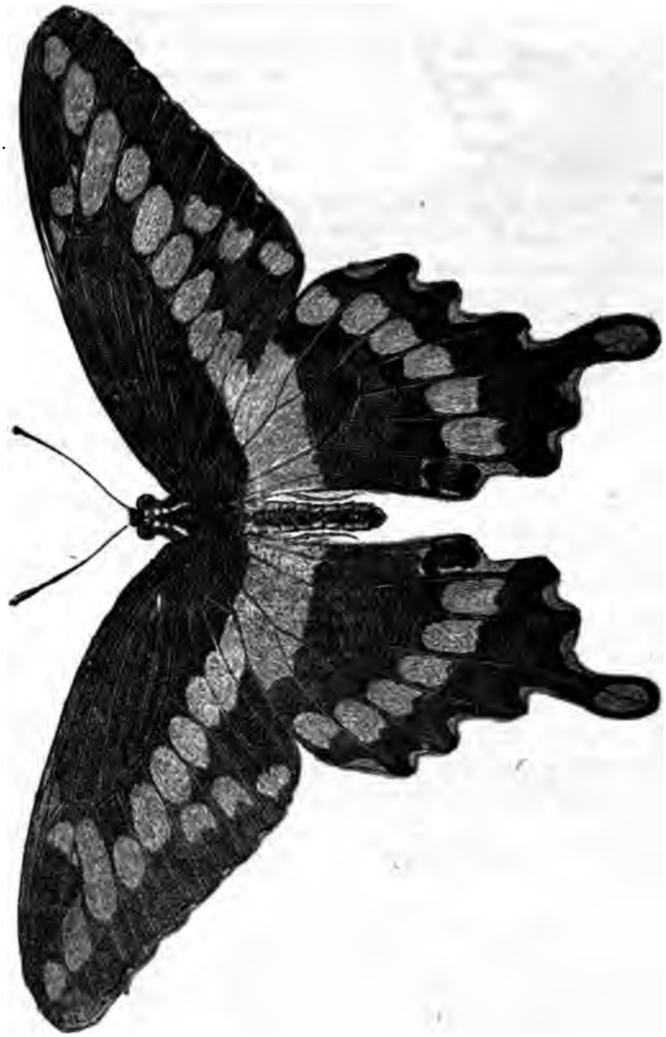


Fig. 36. Papilio cresphontes ; colours, black and yellow.

As an illustration of the spreading of injurious species, Mr. C. P. Butler of London, Ont., reported his finding in large numbers *Crioceris 12-punctatus*, Linn., on his asparagus the early part of August. This is the first observation of it reported in this locality ; and so far as observation went, it was then confined exclusively to his neighborhood. Mr. Butler kindly provided the society with a liberal supply of specimens for its collection. There are two species of injurious asparagus beetles, *Crioceris asparagi*, Linn,, and *C. 12-punctatus*, Linn., and they differ considerably in their appearance, and to some extent in their habits. *Crioceris asparagi* has been on the Canadian list, as having been known to be taken in Canada for fourteen years or more, but it has not yet been reported as having been seen in this city or vicinity, whilst *C. 12-punctatus* will soon prove itself to be the more abundant and destructive species of the two.

Mr. E. M. Walker's observations on the spreading of *Pieris protodice* (Fig. 37) eastward, given in the Thirty-second Annual Report of the Entomological Society of Ontario, page 87, aroused my interest in that butterfly, and I requested the collectors in London to be on the look-out for it; but it was not observed here by any of them. The season was unfavorable for *rapae* (Fig. 23), as it was not nearly so plentiful as in ordinary years, and it may well be regarded as yet more unfavorable for *protodice*, which has been designated "The Southern Cabbage Butterfly." In 1895 *protodice* was reported as plentiful at Windsor, Ont. It was also seen at London where a few specimens of it had been taken the previous year. Since then it has not been observed in London. No further notice of its movements has been taken, so far as I have observed, until Mr. Walker reported it as plentiful at Leamington, Chatham and Sarnia. Which seems to indicate that it is recovering lost ground eastward, but that its appearance at London in 1894 and 1895 should be regarded as a sporadic outbreak, rather than as a permanent advance. The only fresh captured specimen of *protodice* that I have seen this year came from Leamington.

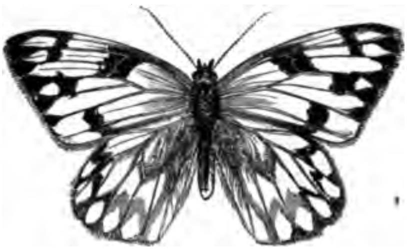


Fig. 37. Pieris protodice; colours, white and black.

Desiring to locate its present boundary eastward, I made a trip to Glencoe. which is about half way between Chatham and London on the Grand Trunk Railway, but found only *rapae* there. So it has not yet got thirty miles east of Chatham; and if it is gradually extending eastward it will be several years yet before it reaches London along that line. But I am under the impression that it will increase more rapidly along Lake Erie shore than it will inland, and my intention was to visit Port Stanley in order to see if it had reached that locality, but a favorable opportunity did not present itself.

If *Pieries protodice* is actually recovering lost ground, how slowly it is spreading eastward as compared with the rapid advance of *P. rapae* westward upon its first introduction into the country. First taken at Quebec city in 1863, and considered likely to have been landed there from Europe three years earlier, it reached Montreal in 1867. Belleville and Trenton in 1872. Port Hope, Toronto and Dundas in 1873. Paris and London in 1875, occuping western Ontario and extending into Michigan in 1876. Thus in thirteen years time it spread from the City of Quebec to the Detroit river. And the marvellous thing about it was that as *rapae* advanced *protodice* disappeared, not leaving a trace of its previous existence in the locality. Now it has taken six years for *protodice* to get from Windsor to Chatham, and then it has not got the whole ground to itself, but only getting to be in the majority. Clearly indicating that *protodice* is meeting with a resistance of some kind to the reoccupying of its lost ground, which *rapae* did not encounter in its progress westward.

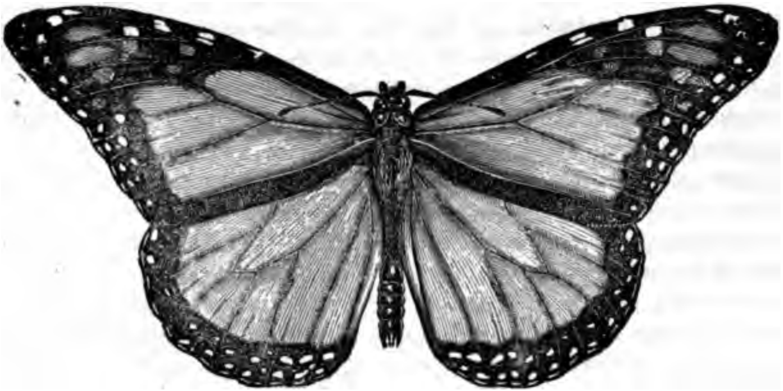
This is an occurrence of the most profound interest to every student of biology, and well worthy of their closest attention and consideration. And in it may yet be found a key to the solution of some of the most obscure and difficult problems of the day, in their relation to the science of life in natural history.

A FEW NOTES ON DANAIS ARCHIPPUS.

BY H. H. LYMAN, MONTREAL.

Were it not for its commonness, I think that this butterfly would be considered, as suggested by the common name proposed by Dr. Scudder, the Monarch of North American butterflies.

It is so large, so strong of wing, and its colours are so rich that its pre-eminence is very marked, and it is so abundant, and so widely distributed that it must be familiar to even the most casual observer of nature. (Fig. 38.)



(Fig. 38.)

As boys, my brothers and I gave it the name of the "Large Striped Butterfly," *Limenitis Disippus* being the "Small Striped Butterfly," and these names had certainly the merit of being descriptive.

But while this butterfly is so common and so easily reared, there is, perhaps, no butterfly about whose life history naturalists have disputed more keenly, and notwithstanding all the arguments and the evidence gathered, the facts have never been made sufficiently clear to preclude further dispute. This shows what a fascinating study is Entomology. There is always something still to be learned about even the commonest species, and everyone, no matter how limited his or her means and time may be, can always add to our knowledge, if only the effort be made in the right way.

The points about which the dispute has chiefly raged are three :

1st. Does it hibernate ?

2nd. How many broods are there ?

3rd. How long do the individuals usually live ?

Mr. Wm. H. Edwards has contended that the life history of this butterfly differs in no essential particulars from that of other hibernating species ; that in Virginia there are four broods, the butterflies of only the last hibernating, and appearing on the wing early the next spring, mentioning the last of March as the time of first appearance, eggs being laid last of April or beginning of May, the 2nd May being mentioned, and the first brood from the hibernators appearing at the end of May.

The late Dr. Riley wrote, "They commence depositing eggs in the latitude of St. Louis during the fore part of May . . . . Butterflies from these eggs begin to appear about the middle of June."

Dr. Scudder claims that in the north (Query : What is "the north" ? and where does it begin in coming up from "the south" ?) the species is only single brooded, that the country is annually colonized by immigrants from the south which lay eggs up to the middle of August; that the butterflies never mate the first season; that some attempt hibernation, but that while hibernation may be successful in a few localities in southern New England, usually every hibernator north of the annual isotherm of 40° perishes; that large numbers migrate south, and pass the winter in an active state, that the butterflies live for more than a year, and mingle on the wing with their progeny of the succeeding season, from which it has been suggested that its common name should be "the Tramp" or "the Patriarch."

Mr. Moffat, in the interesting papers which he has contributed to our Annual Reports, accepts Dr. Scudder's theories, and even adds to them. He appears to claim that all butterflies observed ovipositing in the north have come from the "south," but believes that there are several broods in the south, and that each of these broods is controlled by the same strong desire to travel northward, and that there are thus successive waves of immigrants which lay eggs and produce fresh butterflies, and that these successive waves account for the egg layings from "about the first of June and before," till such late layings as produced the butterfly which Mr. Moffat had emerge on the 6th of November, but Mr. Moffat wisely declines to attempt to draw the line between north and south for this butterfly.

There is one point, however, which is not made clear, and that is whether Mr. Moffat believes that the butterflies which emerge in July from eggs laid by the first arrivals in Ontario continue on the wing in the locality where produced, or also emigrate to still more northern latitudes, and if the latter, whether these having come from the "south" mate and oviposit in these more northern regions.

My own experience of this butterfly extends over many years, but I have probably not given it the same careful study that Mr. Moffat and others have done. I have, however, approached the subject with an unprejudiced mind, and have always been open to conviction, but at the same time confess that by natural disposition I am inclined to look with suspicion upon any theory which attributes abnormal causes to observed phenomena.

The facts, so far as I have observed them, are that in the early summer worn and discoloured females appear on the wing, and are seen ovipositing. These worn and discoloured specimens soon disappear, and no such specimens have ever been seen by me after about the middle of July. What becomes of them? Do they die here after laying their eggs, or do they press on to the "north"?

On many occasions I have first seen these immigrants at the end of June or 1st July. At Au Sable Chasm, on 1st July, 1895, I saw the species for the first time that year, and secured two eggs which I saw laid, and a butterfly reared from one of these eggs emerged 31st July. Doubtless they sometimes arrive earlier. Mr. Winn has seen them earlier. I do not remember to have done so in the neighbourhood of Montreal, prior to 1899, and have frequently searched the Milk Weeds in June for eggs or larvæ without success.

Once only I found a larva nearly full grown, on the mountain, which must have come from an egg laid about the middle of June, but in 1899, on the annual excursion of the Natural History Society of Montreal to Montfort, on 10th June, this butterfly was seen flying, and Mr. Norris found an egg and gave it to me. This egg hatched about the 11th, pupation occurred on the 29th, and the butterfly emerged on the 10th July.

On 1st July of that same year, on an outing of the Montreal branch to Chateauguay Basin, I took a pair in coitu. The male was bright, but the female worn and discoloured. I kept them alive in a cage with the food plant, and secured one or two eggs, and a butterfly reared from one of them emerged on the 4th August.

In 1896 I went down to Portland, Me., on 29th August, and during a ramble on the 30th found a larva of the species nearly full grown, which pupated on 7th September. Allowing the usual time for the larval period, the egg could hardly have been laid before the 15th

August. But what butterfly laid it? Certainly not one of the worn and discoloured spring immigrants. No one, I am sure, ever saw one of them laying eggs as late as the middle of August. What reason is there against supposing that it was laid by a butterfly which emerged about the end of July or beginning of August from an egg laid by an immigrant the last of June or beginning of July?

I accept the colonization theory, but I see no reason to accept the extraordinary hypothesis that this species practises celibacy for a year from its birth.

In regard to the autumnal gatherings, which I regret to say I have never observed, Mr. Moffat's belief seems to require our acceptance of an intelligence scarcely less than human. He speaks of the working of their "minds," claims that a rendezvous is selected, but whether by a representative "committee on place of meeting" duly elected for the purpose, or is named by some Napoleon or Lars Porsena among them, we are not told, and that then messengers are sent forth east and west and north, if not south, to summon the array.

Such a belief is, to me at least, incredible. I have never seen one of these gatherings, but do not doubt that they frequently occur, but I think that if they occurred regularly every year, and that if annual flights to the south were also of yearly occurrence many more observations would have been made and recorded, on account of the size and conspicuous appearance of the species, but I see no reason to attribute anything semi-miraculous to these gatherings.

It is well known that in some years this butterfly occurs in much greater numbers than in others, and it would seem probable that marked swarms only occur in years of great abundance. That a southerly migration also sometimes takes place, may also be conceded but it is not necessary to suppose that scouts are sent out to gather the hosts.

The migration would begin at the furthest point north that the species extended to, and would begin earliest at that point. Naturally, as they flew south they would meet milder climatic conditions, and so be tempted to linger by the way, and to foregather with those inhabitating these regions. That the butterfly has a marked odour is well known, and it seems probable that the odour from these increasing swarms would be carried a considerable distance by the wind, and so tend to attract still more, either from east or west, to these gatherings, of which there are probably not one but many.

Because Dr. Thaxter has observed it wintering, like "the very best society," in the Gulf States, Mr. Moffat concludes that it does not hibernate anywhere, but surely this is too weighty a conclusion to draw from such slender premises.

The life history of this butterfly will never be settled by argument, but the main facts could easily be learned if a sufficient number of intelligent persons would devote a little time to observing the species, and jotting down their observations at the time, as nothing is so unsatisfactory as trusting to one's memory in regard to scientific facts. And to this end I would suggest the issuing by the Society of a leaflet, printed on stout foolscap paper, with one of our Annual Reports, of which a large number are printed and distributed, giving illustrations of the butterfly, caterpillar and chrysalis, and with a series of questions, carefully prepared to elicit information upon all the doubtful points in its life history. That the observers be requested to pin up the leaflet in a convenient place, and fill in their observations as soon as made, and then at the close of the season, when the last of these butterflies have disappeared, to sign and forward them to Dr. Fletcher, to whom they would go post free, and the results could then be tabulated by a committee of the Society.

In order to insure a general interest in the matter, it would be well for the Society, or individual members, to offer a series of say five prizes, ranging from $10.00 to $2.00 for the best and most complete reports sent in.

THE INSECTS OF THE SEASON.

BY W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The year 1902 was one of many surprises for the economic entomologist. Several insects which did serious damage in 1901, and which gave indications that their ravages would be even more serious in 1902, were conspicuous by their absence, or by their very diminished numbers. The Hessian Fly is an example. Again, other insects, which in the last few years were not considered serious, appeared in large numbers and did much damage. The Clover-seed Midge is an example. Other examples will be given in their appropriate place in the following notes.

The wet, cold season had its influence in checking the multiplication of some injurious forms, but in the case of others there was no appreciable check.

INSECTS INJURIOUS TO FARM CROPS.

For reasons, which can be only partially explained, the Hessian Fly (*Cecidomyia destructor*) did very little damage in those regions where it was most abundant last year. While it is true that a much smaller acreage of wheat was sown last fall, and as a rule the sowing was done much later than usual, yet there remains some apparently unaccountable cause for the almost total absence of flies in those regions. The winter and fall were not unfavorable to insect life, if we can judge from the condition of most insects in spring. It is probable that the parasites were more abundant than were supposed, and that they were instrumental largely in killing most of the Hessian Flies.

In South Grey, however, the Hessian Fly did much damage this year, some fields of wheat being entirely broken down by the spring brood. There it appeared to attack certain varieties of wheat in preference to others. For example, the Early Arcadian was untouched, while the early Clawson, sown at the same time, and on the same kind of soil, and under other similar conditions, was seriously affected.

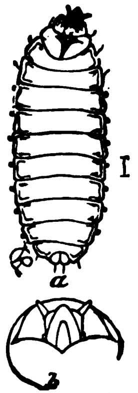


Fig 39.
The Clover-seed Midge: (a) larva highly magnified; b) head retracted, still more highly magnified. (Riley.)

The Pea-Weevil (*Bruchus pisi*) continued its ravages with undiminished vigour in the older sections, and spread to new areas where it had previously been unknown. It is evident that concerted action must be taken or else pea-growing will have to be abandoned. Already in some sections the latter policy has been adopted.

The Clover-seed Midge (*Cecidomyia leguminicola*) Figs. 39, 40 and 41, was abundant in the western portion of Ontario, and in many places completely destroyed all clover left for seed. Even that which was pastured up to June 20th was destroyed, according to some reports. Here, again, farmers must co-operate. All should cut or pasture their clover until the 20th of June.

In many respects, *Wireworms*, Figs. 42 and 43, may be considered one of the most injurious insects which attack farm crops. The extent of the ravages is difficult to compute, for in some localities they are almost absent, but in others they are very abundant.

On account of their habit of working below the surface of the ground, no reliable method has been devised for their destruction, or for the prevention of their attacks. In fields which have been kept for several years in sod, wireworms are almost certain to multiply. When the sod lands are broken up, the "worms" will be found in almost every stage of development. Some are very young and will require two or more years before becoming mature ; some are a year old ; some two years old, and others nearly mature and perhaps entering the pupa stage. It is evident then that the breaking up of the land will destroy but a small number of all the wireworms in the soil. If the ploughing is done in the fall, and the land is kept well stirred until winter sets in, many pupae will be destroyed; but the grubs will be but slightly injured. The roots of the grasses turned under may satisfy their appetite the following season, and the crops may not suffer much. In the second season, however, these supplies of food are exhausted, and the roots of the growing crops are called into requisition. Hence the common complaint that wireworms are often more destructive the second season after the sod is ploughed under. It behoves the farmer, therefore, to put in a crop which is specially immune, such as peas, or a hoed crop.

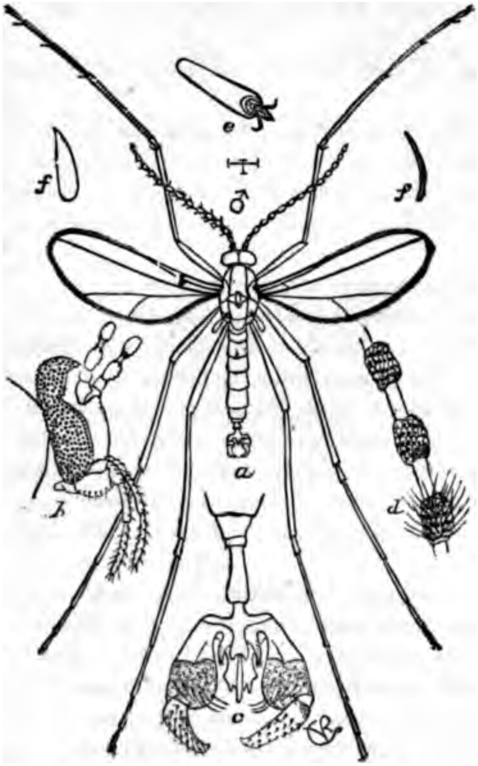


Fig. 40.

(a) The Male Midge, highly magnified; (b) head, further enlarged; (c) clasping organs; (d) joints of antennæ; (e) claws; (ff) forms of scales on body and wings. (Riley.)

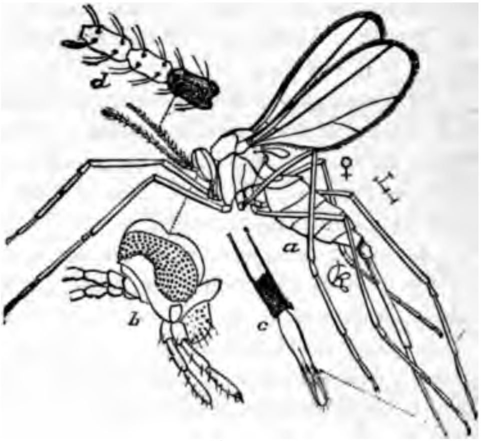


Fig. 41.

(a) The Female Midge, with her four-pointed ovipositor extended; (b) head; (c) tip of ovipositor; (d) joints of antennæ; all highly magnified. (Riley.)

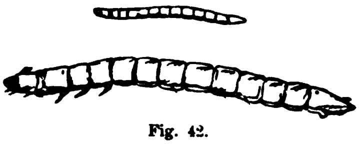


Fig. 42.
Wireworms.

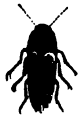


Fig. 43.
Click-beetle parent of Wireworms

The main preventive is a short rotation of crops, in which the fields are not allowed to remain longer than two seasons in grass.

Experiments and experience have both shown that there is no use attempting to kill the wire-worms by soaking the seeds in poisonous chemicals, or by putting poisonous substances on the lands in the hope that the insects will be killed.

Cutworms were quite abundant in many sections of the Province, and did considerable damage.

An interesting observation was made in Kent County where the cutworms were very numerous up to the end of May. Heavy rains occurred at this time, and many of the low, level fields were inundated. Thousands of dead cutworms were seen along the borders of the drowned fields.

INSECTS INJURIOUS TO VEGETABLE AND GARDEN CROPS.

The Colorado Potato Beetle (Doryphora decem-lineata) was not as injurious as in former years. It is probable that the wet season was responsible for the diminution in numbers.

The Squash Bug (Anasa tristis) Fig. 30, was also not so troublesome as in previous years; but the *Cucumber-Beetles* held their own and did much harm.

Blister Beetles were not so abundant as usual, probably due to the fact that *Grasshoppers* have not been numerous for the past two or three seasons.

Cutworms were reported from North Grey as cutting off young mangolds and cabbages.

The Turnip Aphis (Aphis brassicae) did little damage and was not noted in any reports which I received, but the *Cabbage-worm* (Pieris rapae) was quite destructive not only on turnips but also on cabbages and cauliflowers.

The Zebra Caterpillar (Mamestra picta) was quite common in most turnip and cabbage fields. (See Fig. 21.)

At Leamington in Essex County, the *Melon Plant Louse* (Aphis cucumeris) was very abundant in many of the large melon fields. They were kept in check by a careful application of tobacco solution. These insects are greenish-black, and infest the under surface of the leaves; consequently, the tobacco applications must be made to the under surfaces by means of an elbow on the rod near the nozzle.

Asparagus beetles were not so destructive this year as usual about St. Catharines.

The Tomato and Potato Flea-beetles (Epitrix cucumeris) were very abundant. It is of interest, economically, to note the relation of these flea-beetles to the *Early Potato Blight*, which was prevalent this past season. The edge of the holes eaten by the beetles soon became diseased, and examination showed the presence of spores of the *Early Blight* (Macrosporium solani). It is probable that the beetles are carriers of the disease from one leaf to another, and it is more than probable that the dead tissue surrounding the holes made by the beetles forms a suitable medium for the establishment of this semi-saprophytic fungus.

Early applications of Bordeaux and Paris Green are necessary for the control of the beetles as well as the fungus.

The Potato Stalk-Borer (Trichobaris 3-notata) Fig. 44, which committed such serious ravages in Pelee Island last year, appeared again this year, but in diminished numbers. Many potato-growers on the Island suffered greatly, but definite information as to the real extent of the injury done is wanting on account of the more serious damage done by the *Late Potato Blight* (Phytophthora infestans). The death of the stalk by the fungus may aid in killing the stalk-borer, since the larvæ may be prevented from reaching maturity. It is the duty of the potato-growers, however, to take the usual precautionary measures, viz., to burn the vines in the field in the fall, so as to kill the surviving adult beetles, which would otherwise hibernate in the dead stalks.

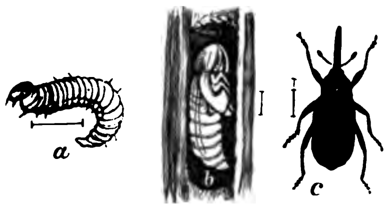


Fig. 44.—Potato Stalk-borer: *a.* grub; *b.* pupa; *c.* beetle, all much magnified.

INSECTS INJURIOUS TO ORCHARD TREES.

In spite of the unfavorable wet season, the San José scale increased in large numbers in the infested sections. The pernicious nature of the scale is now impressing itself strongly on the minds of the fruit-growers, and they are coming to the conclusion that the warnings of the entomologists, uttered seven or eight years ago, were warnings which should have been heeded then, and not now. The orchard men themselves must now bear the burden of controlling the scale. Their task is far from being a hopeless one, however. Experience shows that there are several insecticides which may be used with good results. These are whale-oil soap, crude petroleum, and the lime and sulphur mixture. The last is by far the cheapest remedy, but the great objection to its general adoption is the difficulty of preparation. Two pounds of lime are boiled with one pound of sulphur in a kettle for two hours. Much requires to be known concerning the chemistry of the resulting mixture, for different sulphides of calcium are formed according to the time the mixture is boiled. It is probable that some one of these sulphides is more effective than the others.

The example of Saltfleet Township is to be commended when it passed a by-law whereby inspectors were appointed to make a careful examination of the orchards for San José scale, in view of preventing its spread. It is to be hoped that other municipalities will follow the example set by Saltfleet, so that a limit may be placed to the spread of the scale.

The Codling Moth (*Carpocapsa pomonella*), so far as my own observations extend, was not so injurious this year as last. The first brood appeared rather late, but the second brood was quite numerous. The wet season precluded careful spraying operations which may account for the large second brood.

A correspondent from South Grey reports that the Codling Moth was very injurious. He says: "It would not be exaggerating to say that *one-third* of the apple crop was destroyed by this pest."

In my last year's Notes on the Injurious Insects of the Year, I called attention to the worthlessness of the Haseltine Moth Trap-lantern.

Recently another device for entrapping the Codling worms has been put on the market. It is known as the Expansive Tree Protector. It consists essentially of an expansive metallic collar, coated on its underside with a sticky substance, and a cloth band saturated with a poisonous liquid placed between the collar and the trunk of the tree. Although not in a position personally to test the device this year, I had an opportunity of inspecting many of them in different orchards. In nearly every case they failed to give satisfaction, and in some instances were positively harmful. In the first place, they are difficult to fit to the trunk of the tree; secondly, the sticky substance did not hold the caterpillars, and other forms of insect-life, or prevent them from crawling over it; thirdly, the poisonous band did not kill the insects which crawled beneath the collar; and fourthly, the bark of the tree immediately beneath the band was frequently seriously injured.

In my humble opinion, decided improvements in the construction of this device must be made before it becomes effective.

In Prince Edward County the Apple Maggot (*Trypeta pomonella*) was abundant. In some orchards more than half the fruit was injured by this maggot.

The work of this insect differs from that of the Codling-worm in that channels are eaten through the fruit in every direction. Spraying is of no value in combating this pest, and the remedy is one of prevention. The infested fallen fruit should be destroyed at once, so as to prevent the maturing of the flies. When the maggot is full grown it leaves the apple, and pupates on, or just below the surface of the ground.

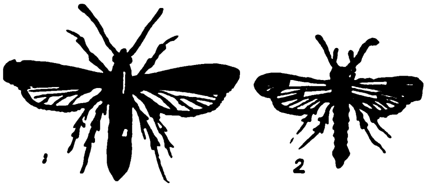


Fig. 45. Peach-tree borer, female moth ; 2 male moth.

Peach-tree Borers (*Sannina exitiosa*) Fig. 45, were very numerous, especially in the Niagara district. Many young trees of this year's planting were injured.

The Plum Curculio (*Conotrachelus nenuphar*) was abundant in most sections of the Province.

The Bud-moth (*Tmetocera ocellana*) Fig. 46, and the Cigar-case Borer (*Coleophora Fletcherella*) were serious pests in many orchards the past season, and it is my opinion that the latter is becoming more injurious with each succeeding year. Last spring I saw an orchard in which every tree was badly infested. In some instances, the wintering cases literally covered portions of some of the smaller branches. It is true that the orchard referred to was a neglected one, so far as insects and fungi are concerned, but it is also true that both the Cigar-case Bearer and the Bud-moth are difficult to treat successfully. Both insects are well protected by their coverings, and experience shows that thoroughly careful spraying at the right time is required to kill them. Fortunately for the orchardist, both begin active work about the same time, hence both can be treated at the same time.

Fig. 46. Bud-moth and larva.

I feel that more demonstration spraying in the infested orchards is necessary before the fruit-growers will be convinced that these insects can be treated successfully. Seven or eight years ago it was shown that two or three applications of Paris green (4 ounces to the barrel) as soon as the cases became active in the spring, would hold the Case-bearers under control. Also, that kerosene emulsion, diluted with nine parts of water, applied at the same time was quite effective.

Aphids were unusually abundant in many orchards.

INSECTS INJURIOUS TO SHADE TREES.

The protection of shade trees from the attacks of boring insects is becoming quite a serious problem in many of our towns and cities. It is becoming apparent that greater watchfulness is required. The watchman, however, should have some acquaintance with the habits of the insects to be watched, so that remedies may be taken at the right time. One of the duties of the watchman, however, should be the protection of our insectivorous birds, for we must rely to a great extent upon them for the destruction of the borers. The increase in number of borers in recent years, I think, can be traced to the wanton destruction of so many of our useful birds, and their protection at the present time is imperatively demanded.

A shade tree pest, new to me, has arrived within the last two or three years. The birches are the victims in this instance. I have watched their work in Guelph for two summers. I thought at first that the birches were dying from the physiological causes which produce *Stag-Head*, but I was wrong in my diagnosis. My attention was called this summer to dying birches in Hamilton, where an examination of the dead limbs revealed the presence of a borer. I was unable to get specimens of the adult, but the owner of the trees stated that he saw many of them in early summer. On account of their small size and their active habits, he was unable to make any captures.

From a study of their work, I was able to identify them as the Bronzy-birch Beetle (*Agrilus anxius*), one of the Buprestidae. This borer has been found working in London, Buffalo, Detroit, Ann Arbor and Chicago.

It would appear that the beetles begin work at the top and work downwards. For this reason, the tree begins to die first at the top. The burrows made by the grubs are very irregular, and have no definite direction. In most limbs which I examined I could trace their labyrinthine, net-work courses for considerable distance in the cortex and young wood, but often they would run directly into the wood, and emerge again at the surface. In one case, I found a straight tunnel in the heart-wood, but this occurred in a small twig not more than one-third of an inch in diameter.

The exit hole of the mature beetle is characteristic, I think. One side is straight, and the other is curved to conform to the shape of the beetle.

The effect of all this burrowing of many grubs in infested trees is to weaken the branches and to interrupt the supply of food and food-materials to the parts above. Some of the trees which were examined in Guelph and Hamilton, had their bark from top to bottom perforated with holes. Many of the larger limbs had raised ridges on the bark, which, when cut open, showed burrows beneath.

The life-history of this insect is about as follows: The adults emerge in May, and begin laying their eggs in crevices on the bark. The larvae hatch in June, and are not full grown when winter sets in. They remain torpid during the winter, and become full grown in April or early May. The pupa stage is of short duration, for the adults begin emerging in May, as already stated.

It is impossible at this stage in the study of the insect to indicate a definite line of remedial treatment. As the beetles are capable of flight, it is necessary that dying and dead trees should be cut down before the escape of the beetles in May to prevent the infection of neighboring healthy birches. Their natural enemies are unknown to me, with the exception of the woodpecker, which I have seen frequently on affected trees. It is likely that we will rely upon this bird to help us in controlling this new pest of the birch.

THE PAPER-MAKING WASPS OF THE PROVINCE OF QUEBEC.

By Rev. Thomas W. Fyles, D.C.L., F.L.S., Levis, Quebec.

Once upon a time, I was taken over a pulp-factory, and shown how billets of wood were converted into paper. The process seemed to me a natural outgrowth from one that I had witnessed, when a boy, among the descendants of Huguenots who settled at Dartford in Kent two hundred years ago. These men, in their little workshops, manufactured paper from cotton rags.

The fineness and tenacity of vegetable fibre have been ever since the creation; and paper-makers (not always human) have existed, in successive generations, through all the ages since that great event.

"The thing that hath been is that that shall be, and that which is done is that which shall be done; and there is no new thing under the sun."

"Is there anything whereof it may be said, this is new? It hath been already of old time which was before us."—Ecc. I.. 9-10.

The nest of the Black Hornet (*Vespa maculata*, Fabricius) Figs. 47 and 48, is a wonderful structure, suggestive of a variety of things,—tents, umbrellas, capes, the papier-maché dwellings of the Japanese, compressed woodenware, etc.

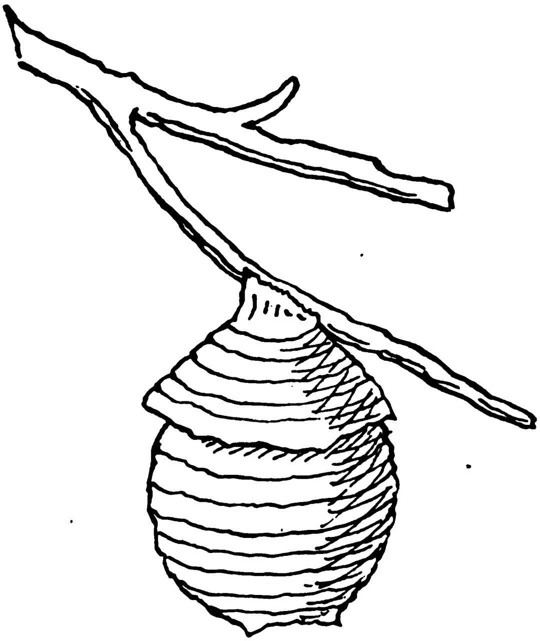


Fig. 47. Wasp's nest at an early stage of construction (original).

It is often of great size. The Rev. J. B. Dobbage of Bourg Louis has one that measures round it, over top and bottom three feet two and three-quarter inches and, when taken round the middle, two feet nine and a half inches.

Our fences and out-buildings supply abundance of material for the busy workers tha construct such dwellings. In the wilderness they resort to trees rent by tempests, etc., for their supplies.

The old church at Hull, Province of Quebec, was built of wood. It had never been painted. One summer day, about thirty-seven years ago, when on a visit to Hull, I walked up to see the church. It stood on a rocky knoll and was surrounded by cedars—the French part of the town now covers the spot.

I thought to look in at the windows, but these were high up ; and I did not venture to climb, for busily employed about the building were hundreds of wasps, of different kinds. They were eroding the surface of the wood with their jaws—procuring the materials for the construction of their nests.

The material thus procured would be thoroughly masticated and mixed with a natural fluid or saliva, till it was of the right consistency. The wasps, on commencing their work, would deposit the prepared material and then bring it into shape with their mandibles, going over it again and again, pinching it till it was of a proper thinness.

The comb in the hornet's nest is very different from that in a hive of bees (Fig. 48). The bee's comb is of wax ; the hornet's of paper. The bee's comb is suspended in masses perpendicularly — the cells, two deep, being placed back to back and opening sideways. The hornet's comb is suspended in tiers horizontally, the topmost tier hanging by a stalk to the roof, and each of the others by a stalk affixed to the centre of the one above it. The cells are only one deep in each layer, and open below. In the beehive some of the cells are filled with honey and some contain young bees. In the hornet's nest all the comb is brood comb, the young being fed with nutriment prepared by the mandibles and maxillæ of their attendants. (Fig. 49).

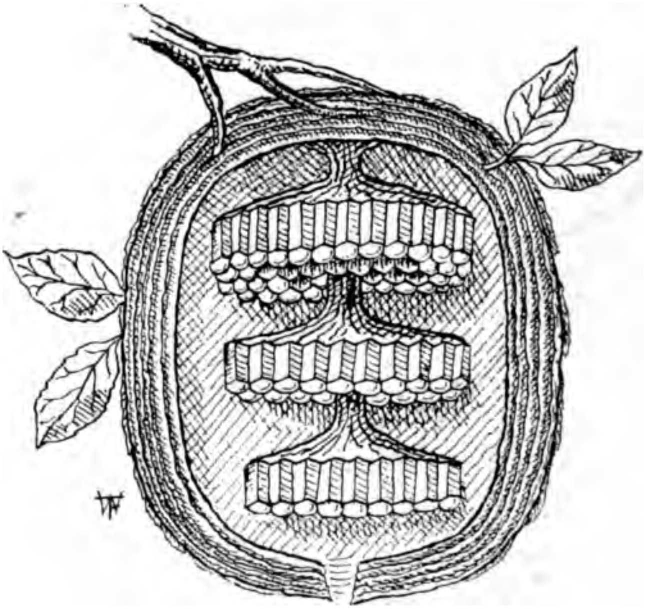


Fig. 48. Section of Hornet's nest (original).

The larvæ of the hornet, in their early days, are held in place by a glutinous fluid, and later, by pressure upon the sides of their cells. When they are about to change to pupæ, they spin a web over the entrance of their cells and close themselves in.

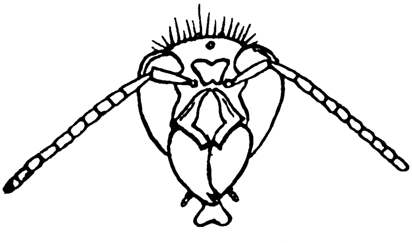


Fig. 49. Head of Wasp, showing mouth parts (original).

Mr S. Stone, in the *Entomologist's Weekly Intelligencer* for June 11th, 1859, (No. 141, page 84) thus described the process of feeding the larvæ in a wasp's nest :

" The process is an extremely interesting one. An attendant or nurse on retiring from a foraging excursion with a caterpillar it has found on a neighbouring hedge ; a piece of meat neatly rolled up, that it had purloined from a butcher's shop or somebody's larder; a specimen of the insect popularly known as 'daddy-long-legs,' shorn of its wings and other encumbrances, especially if the day be a windy one, for the purpose of lessening the difficulty of conveying such an unwieldly creature through a disturbed atmosphere—for wasps have powers as nearly as possible allied to reasoning ones, as has been observed upon other occasions as well as the one recorded above; or perchance a winged ant caught in the act of migration, is met at the entrance to the nest by one, two, and sometimes three other attendants. These at once lend their aid in cutting up the 'prey,' which they not only reduce to the consistency of pulp by mastication, but to all appearance actually swallow. Having done this they separate, and taking different courses, commence feeding the larvæ which lie in their route. As they pass over a cell, the larva therein contained, if hungry, protrudes its head and applies its mouth to that of the attendant, who stops for a few seconds for the purpose of allowing it to sip its fill. This done, the latter moves on to another cell, where the process is repeated. If on the approach of the attendant a larva does not require food, instead of protruding its head it remains quiet, when the former passes on to another cell where its services may be required. In this way an attendant will feed perhaps twenty larvæ before the contents of its stomach, or whatever else may have served as a receptacle for the food it has been dispensing, is exhausted, when it again proceeds in quest of food, either leaving the nest to obtain it, or else taking part, in the manner already described, with one which has just returned from foraging."

It will be observed from the above account that the wasps feed their charges much as the dove feeds her young, by supplying them with partly digested food from its own crop.

Mr. Stone's observations upon the feeding of the wasp-larvæ confirm those made by Mr. Spence as recorded in Letter XI, *Kirby and Spences's Entomology*, and by Willoughby and Réaumur before him.

Vespa Germanica, Fabricius—like the European *Vespa vulgaris*, Linneus—makes its nest in a chamber in the ground, taking advantage of some natural hollow, or enlarging the run of some small animal. I found such a nest by the roadside on the Island of Orleans last summer.

Some years ago I took a nest of *Vespa media*, Olivier. I found it suspended from the ceiling of a coach-house belonging to my highly-esteemed friend, the late I. J. Gibb, Esq., of Como, P. Que. This nest was compact and smooth, and of the size of a cricket-ball. The entrance was in the middle of the under side, and was about half-an-inch in diameter.

The late P. H. Gosse in the *Canadian Naturalist*, page 269 describes the nest of *Vespa marginata*, Kirby. He says:—

"That is not a stone, although it looks so much like one, as you would find to your cost if you planted your foot on it. The mowers have cut as near as they durst approach to it, for it is a wasp's nest (*Vespa marginata*) and full of very irascible and formidable subjects, who are not to be assaulted with impunity. These large round nests are generally attached to a stone, often nearly covering it, and cannot easily be distinguished from it. They are made of a tough whitish paper, manufactured by the wasp, of the minute particles which she abrades from weather-beaten wood, and agglutinates with saliva, spread out into this form. This nest consists of several layers, convex above, and projecting at the edges to shoot off the rain from the comb within, which is made of the same substance, and contains young and pupæ. You may observe numbers of the wasps coming and going, and crawling busily about the nest, the entrance to which is beneath the edge."

Vespa marginata, Kirby = *Vespa consobrina*, Saussure = *Vespa arenaria*, Fabricius. See Cresson's HYMENOPTERA, page 290.

I found a nest of this species last season in the open woods near Fort Number 2, Levis. It was close to the ground, and was supported by some small stems of brush wood. I went one cold day in October to obtain it, but somebody had forestalled me.

Among the bees there are large females, small females or workers, and males or drones; so is it among the wasps; and the male wasps are stingless as the drones are. They may be distinguished from the females in this way :—

The male wasps have 13 joints in the antennæ.

The female wasps have only 12.

The male wasps have 7 abdominal segments.

The female wasps have only 6.

Bees, wasps and ants have the three kinds,—males, females and workers. It is customary amongst naturalists to distinguish these by the astronomical signs for Mars, Venus and Mercury. The sign of Mars is a shield and spear ♂. That of Venus is an apple with its stalk ♀ —in reference to the golden apple awarded to her, as the most beautiful of the three goddesses (Juno, Minerva and Venus), by Paris. That of Mercury, the *caduceus*, or staff with serpents intertwined ☿.

Hornets and wasps are not troublesome unless they are molested. They destroy vast numbers of flies and destructive larvæ, spiders, etc. But, strange to say, the wasps themselves fall victims to predacious flies (Asilidæ) which know how to pounce down upon them, and seize them, just so that they can neither use their jaws nor their stings.

The following is a table of the Quebec Paper-making Wasps :—

Family VESPIDÆ.

Genus *Vespa*, Linneus.

1. The Black Hornet, *Vespa maculata*, Fabricius.
2. The Margined Wasp, *Vespa arenaria*, Fabricius.
3. The German Wasp, *Vespa Germanica*, Fabricius.
4. The Diabolic Wasp, *Vespa diabolica*, Saussure.
5. Fernald's Wasp, *Vespa Fernaldi*, Lewis.
6. The Scalloped Wasp, *Vespa media*, Olivier.
7. The Red Wasp, *Vespa rufa*, Linneus.
8. The Common Wasp, *Vespa communis*, Saussure.
9. The Northern Wasp, *Vespa borealis*, Kirby.

Genus *Polistes*, Latreille.

1. The White-footed Polistes, *Polistes pallipes*, Lepell

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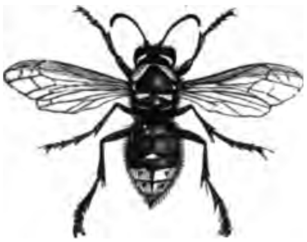

Fig. 50.—Vespa Maculata, the Black Hornet.

1. The Black Hornet (Fig. 50), is so named to distinguish it from the Yellow Hornet of Europe (*Vespa crabro*, Linneus). It is the largest and most formidable of our wasps. It is common and well-known.

2. *Vespa arenaria*, is known to the French Canadians by the term "Guêpe cousine." It is a handsome black wasp with narrow, white or yellow margins to the abdominal segments.

3. *Vespa Germanica* is a beautiful little wasp, and has much yellow about it. It may be easily recognized by the yellow bands on the first segment of the abdomen which form a loop, and enclose a triangular patch of black.

4. The female of the Diabolic Wasp is about six-tenths of an inch long. It is black with long yellow hairs. It has much yellow on the abdomen. Upon the first segment, the yellow

is narrow and interrupted. Upon the others, it is indented by the black, in the middle, and on either side of the indentation is a black dot. Saussure must surely have been severely stung by this wasp when he gave it its formidable name.

5. *Vespa Fernaldi* was identified for me in the Entomological Division of the Department of Agriculture, Washington. It is a pretty insect. In each of the abdominal segments the black intrudes upon the yellow by three indentations, of which the apical one is the largest.

6. In *Vespa media* all the segments of the abdomen are marked alike with three scallops protruding from the black band of every segment. The workers especially of this species have much brown hair about them.

7. *Vespa rufa.* Last summer I took a perfect female specimen of this beautiful and rare wasp. It was flying under the veranda of Mr. Morgan's country-house on the Island of Orleans. The insect is three-quarters of an inch long, and an inch and a quarter in expanse of wings. The antennæ was black without spots. The eyes are black and have an outer streak of white on the upper off side only. Between the antennæ is a white patch, indented above and below, and broader than deep. The white facial plate is angulated outwardly, and is divided, through all its length, by a broad black patch somewhat narrowed towards the bottom. The legs of the insect are pale yellow above and red underneath. The marks on the thorax are white. The segments of the abdomen are bordered with creamy white. The wings are somewhat smoky, but have an ochreous tinge, and the veins are sienna-coloured. The first abdominal segment of this wasp is of a rich chestnut or venetian red; and on the second segment there is an interrupted patch on either side of the same colour. This segment is, with the exception of the border, wholly dark red on the under side. The tip of the last segment is red. The wasp is strikingly handsome. In the Provancher collection there is a worker of this species taken at Chicoutimi.

8. *Vespa communis* also was identified for me at Washington. It, more than any other of our Quebec wasps, resembles the *Vespa vulgaris* of Europe. I have taken it at Cowansville and at Quebec.

9. *Vespa borealis.* The wasp is described in Kirby's "Fauna Boreali-Americana: Insecta" page 265. The description may be found on page 129 of Dr. Bethune's useful compilation from Kirby's work, which was published by the Entomological Society of Ontario some years ago. Kirby states that the specimen he described was taken as far north as lat. 65°. A male specimen of this species that I took at Levis last summer has been identified for me by Mr. Ashmead of Washington.

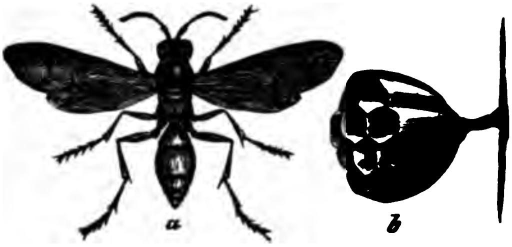

Fig. 51.—Polistes pallipes; *a.* the wasp; *b.* portion of comb.

Polistes pallipes may be easily known from its slender and elegant form, its soft brown colouring, its white feet, and the two parallel longitudinal streaks on the after part of its thorax. (Fig. 51.)

I will now close my paper with a story told me by Mr. H. Brainerd of Montreal. It tells of an entirely effective, but *somewhat costly* method of getting rid of a wasp's nest.

The Hamilton Powder Company had a magazine at Dinorwic, Ontario. In it was stored four tons of dynamite. One day in last September two Irishmen were sent by the Hudson Bay Company, to take out a supply of the explosive. There was a wasps' nest under the eaves of the building, and an irritated wasp stung one of the men. He "got mad," and vowed he would "smoke the critters out," so he made a "smudge." Now the ground had become saturated with nitro-glycerine, and no sooner was a light applied to the smudge, than an ominous flash alarmed the men, and they took to their heels. They had gone but a short distance when there was a fearful explosion and they were struck down senseless. On their recovery they told how the affair had happened.

The loss was—the building; the dynamite, worth about $1,200; charges for broken glass, $140; and a smashed canoe; *but no trace of the wasps' nest could be found.*

SOME INTERESTING HABITS OF LEPIDOPTEROUS LARVÆ.

By Arthur Gibson, Ottawa.*

The student of insects is continually being astonished and mystified by the wonderful things which are ever occurring in the entomological division of the animal kingdom. No matter what kind of insect study one may enter upon, nature never fails to present a varied, at times incomprehensible, series of interesting objects. In the lepidoptera there is no exception to the rule. While mysteries will continue to be, at the same time, owing to the rapidity with which the science is now developing, many of the facts which are, as yet, unexplainable, will doubtless in the near future be expounded, and knowledge which we are now badly in need of, be duly placed at our disposal. A study of the larvæ of our butterflies and moths will soon convince the student that there is much of interest as regards even the habits of the commonest species, many of which show remarkable traits.

As the title given this paper covers a wide field it is only the writer's intention to mention, in a general way, some of the interesting habits which have come under his notice. When asked for a short paper it occurred to me that if I could put together a few facts concerning the habits of some of these larvæ, my endeavor might not be without interest.

At the outset a short mention will be made of the feeding habits of these creatures. All have doubtless seen some caterpillars feeding, and know that the particular habits of each kind vary to a great extent, almost every species showing some peculiarity. While some caterpillars are extremely restricted in their choice of food, only feeding on one or two plants, others are quite indifferent and will eat almost anything, some species having been known to eat up everything in sight. A good common example of the former class is the Monarch Butterfly, *Danais archippus*, Fab., the larvæ of which are known to feed only on *Asclepias*, while in illustration of those which are general feeders, the Variegated Cutworm, *Peridroma saucia*, Hbn., might be cited. During July and August, 1900, the caterpillars of this species fairly swarmed in the Province of British Columbia and the States of Oregon and Washington, devouring plants of all kinds and causing a loss to grown crops of $168,000 in British Columbia alone, from which it has been estimated that a loss of $2,500,000 accrued in that year in the United States and Canada.

From an economic point of view an understanding of the feeding habits of larvæ is important. It is well known that if the grower of any marketable crop desires to obtain the fullest returns, a knowledge of his insect enemies will materially aid him, when his fruit trees, cereals, etc., are attacked by any of these pests. While some caterpillars are general feeders, most species, however, are particular in their choice of food In the event of a certain caterpillar occurring in large numbers upon any single kind of fruit tree, or crop, anxiety or loss and unnecessary work may be prevented if it be known to the producer that the species only feeds on the plants upon which it is first found, or those botanically related, and that it is not likely to spread to adjoining crops. Of course there are instances of certain caterpillars doing damage to plants upon which they were not previously known to feed, but such occurrences are unusual. Cutworms, for instance, which are the caterpillars of the Agrotid moths, as a rule only feed at night, generally confining their attacks to low plants, such as cabbages, cauliflowers, etc., so during serious outbreaks apprehension as to danger to near-by trees, or other crops, may, in many instances, be avoided.

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* Read before the Toronto Branch of the Entomological Society of Ontario.

Some species of larvæ have the habit of lying close together in serried ranks when feeding, and many of congregating when resting. Interesting examples of the former kind are *Procris Americana*, Harris, Fig. 52, *Attacus promethea*, Dru., and *Hyperchiria io*, Fab., which, when in their younger stages, feed in a row, each larva beside the other, on the underside of a leaf. *Vanessa antiopa*, Linn., and the *Datanas* are examples of those which feed in colonies, a small branch having as many as fifty or more, close together, while on the remainder of the tree there may not be a single specimen. The two kinds of Tent Caterpillars furnish splendid examples of larvæ, which congregate in masses when not feeding. Everyone has seen the tents of *Clisiocampa Americana*, Harr., the true tent caterpillar, containing large numbers of the larvæ, and most people have doubtless seen the large masses of the Forest Tent caterpillar, *Clisiocampa disstria*, Hbn., which does not make a tent, the larvæ when at rest congregating on a silken mat spun on the trunk of a tree or along one or two of the branches.

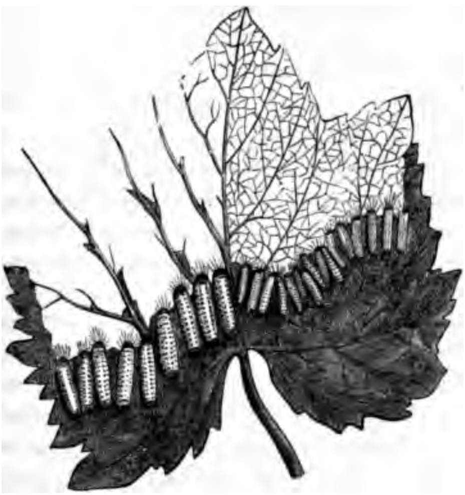

Fig. 52. Procris Americana larvæ feeding.

While many species of caterpillars have the habit of congregating in numbers, others are quite the opposite, and are solitary throughout the whole of their larval existence, not more than one, or at most two, specimens being found feeding on a single plant. A common interesting illustration of this is *Arzama obliquata*, G. & R. The larva of this species is a borer, feeding inside the main stem of the common Cat-tail, *Typha latifolia*, L., inside of which it also generally passes the pupal state. Specimens, however, when mature sometimes leave the Cat-tail and wander, or swim, to the shore or edge of the swamp to seek a suitable place to pupate,—under a rock, piece of fallen branch, or in an old stump under the bark or in the rotten wood. I have collected hundreds of specimens of this caterpillar in various localities and only rarely have found two specimens in the same plant. These larvæ when full grown measure nearly two and one-half inches long, and not possessing any attractive qualifications can hardly be termed beautiful caterpillars. Mr. Henry Bird, who has done such good work in *Hydroecia*, relates the interesting habit of *Hydroecia duovata*, one of his new species. In a letter to Dr. Fletcher he says that "thousands of plants (*Solidago sempervirens*, L.) may be examined without any sign of a borer. A dozen isolated ones in another neglected spot may contain twenty-four larvæ, not twenty-three, or twenty-five, but the two dozen to a nicety, for Mrs. Duovata can count up to two without any failure when depositing her ova." Among the butterfly larvæ those of *Pamphila metacomet*, Harr., and some other skippers, which Dr. Fletcher has specially studied, are solitary in habit. These caterpillars feed on various species of *Carex* and curiously enough furnish themselves with a cocoon-like structure, in which they live when not feeding. This interesting contrivance is placed between two of the larger leaves which are drawn together and fastened by means of silk. This habit of course provides great protection to the caterpillar, as it is only by separating almost everyone of the central leaves of a plant that their home can be found. It is altogether unlikely that many have seen these caterpillars in nature, as they require to be looked for very closely.

During the past two summers the foliage of birch trees of all kinds, was badly attacked by the larvæ of *Bucculatrix Canadensisella*, Cham. These small caterpillars occurred in vast numbers throughout Ontario, but were not noticed by the public until late in August when the trees assumed a seared appearance, and the leaves were dropping prematurely. These larvæ are popularly known as the Birch Skeletonizer, from the way they eat away the cellular tissue of the foliage, leaving only the fibrous skeleton, and are of considerable interest from the peculiar habit they have, which is quite unusual, of spinning on the leaves, before full grown, flat circular shelters, called pseudo-cocoons, whenever they are ready to moult. These little shelters, which of course are only large enough to contain the one larva, are only used by the caterpillars about a day or so before the process of casting their skin.

An interesting example of a caterpillar illustrating protective mimicry was observed last season by Dr. Fletcher and the writer. In May, 1901, larvæ of one of the noctuid moths, *Homohadena badistriga*, Grt., were found in some numbers on the yellow-flowered honeysuckle, *Lonicera hirsuta*, Eaton. Caterpillars in all stages were found, but strange to say no trace of eggs could be seen. Very small larvæ were collected about a quarter of an inch long, which must have been out of the egg only a day or so. Doubtless, as is often the case, the young caterpillar made its first meal of the shell from which it had emerged. It is probable that some eggs were still on the plant, but although searched for diligently, none could be discovered. When young the caterpillars feed on the foliage of the new shoots of the plant and generally hide inside the two clasping leaves which surround the cluster of flower buds at the tip. When mature they crawl down to the shady side of the old wood of the plant, upon which they rest when not feeding. At this time the general colour of the caterpillar is remarkably like that of the stem, or twig, upon which it is resting, and owing to this striking resemblance, it is thus protected from numerous enemies.

Many other larvæ owing to their colour being similar to that of the plant upon which they feed are likewise hidden from view, and unless searched for carefully, even when they are known to be present, are difficult to find. *Plusia æreoides*, Grt., which feeds on *Solidago Canadensis*, L., is another example of a corresponding similarity in coloration of the caterpillar to the green colour of the leaves and stem, protecting the species from natural enemies, such as birds, parasites, etc.

The larva of *Nerice bidentata*, Walk., feeds on the foliage of elm ; it is a rather curious caterpillar with sharp protuberances down the dorsum. This species feeds on the edge of a leaf, and owing to its colour being the same as that of the foliage, and its peculiar elevations on the dorsum corresponding with the outline of the leaf, it is thus protected considerably from being observed. A similar example of protective resemblance is found in the caterpillar of *Telea polyphemus*, Cram., which when feeding on the edge of an elm leaf from which it has eaten out a portion, is even better protected than the above by reason of its indented dorsal outline and the bright lateral stripes, which simulate the ribs of the leaf.

An interesting habit which certain of the Coliad larvæ have, is that of resting exactly in the same place, after feeding, along the mid rib of a leaf. When wandering off to feed they spin a path of fine silk as they walk. After they have eaten their meal they are thus able to return by following this silken road to the exact spot from which they first started. *Papilio turnus*, Linn., also has the habit of spinning a platform of silk across the upper side of a leaf upon which it rests when not feeding. (Fig. 53).

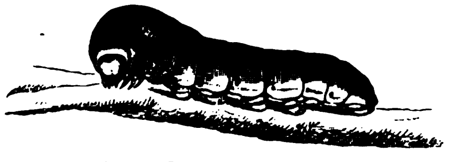

Fig. 53. Larva of Papilio turnus.

Doubtless every collector of insects, or student of natural history, has noticed the habit which many caterpillars have of drawing two or more leaves together by means of threads of silk, in which they feed, or in which they rest when not feeding. Some larvae curl up a single leaf, fastening the sides with silk, and live inside the enclosure thus made until they have eaten nearly the whole leaf, when they go to another leaf, and so on until they reach maturity. The caterpillars of some of our common butterflies, such as *Vanessa Milbertii*, Gdt., *Pyrameis cardui*, Linn., etc., have this habit. The larvæ of the large skipper *Eudamus tityrus*, Fabr., which feed on the Locust-tree, *Robinia Pseudacacia*, L., and *Nisoniades lucilius*, Lint., on Aquilegias also live inside tents, which they make by drawing down a leaf to serve as a cover fastening the same to another leaf immediately under. One end of the leafy case is left open to enable the caterpillar to get out to feed.

Phlyctaenia ferrugalis, Hbn., which is an interesting species on account of its economic importance, has been called the Greenhouse Leaf-tyer, from the habit of the larvæ of drawing the leaves together, and tying them with silk. When this caterpillar is at rest it has the habit of curling round to the side of the body the head and first three, or four, segments. Many of the larvæ of the smaller species of moths fold, or roll over the edge of a leaf and seal down the whole of the turned edge with threads of silk. These small caterpillars live through all their larval stages inside the same enclosure, in which they also change to the chrysalis state. Everyone must have noticed the work of the common Basswood Leaf-roller, *Pantographa limata*, G. & R. This larva cuts a leaf half way across the middle, and then rolls the end portion into a tube, within which it lives.

Some caterpillars when at rest assume curious positions. Many geometrid larvæ have the habit of extending the whole body straight out into the air, the anal prolegs and feet firmly clutching the twig, or leaf, upon which they happen to be. They often remain in this position for a considerable length of time, without even slightly moving the body. In numerous instances the colour of the caterpillar, and the object upon which it is resting, is almost, if not quite the same, and the larva may appear as an additional twig, the casual observer being unable to differentiate between the living caterpillar and the object upon which it rests. The larvæ of the Sphingidæ, or Hawk-moths, when resting have the habit of rearing the front of the body into the air, curling the head and first segment, down in a most stately manner (Fig. 54). They have been known to remain in this position perfectly motionless for hours. On account of this habit they are when thus resting supposed to resemble the Egyptian Sphinx, and owing to this resemblance the name Sphinx, and the family Sphingidæ is due.

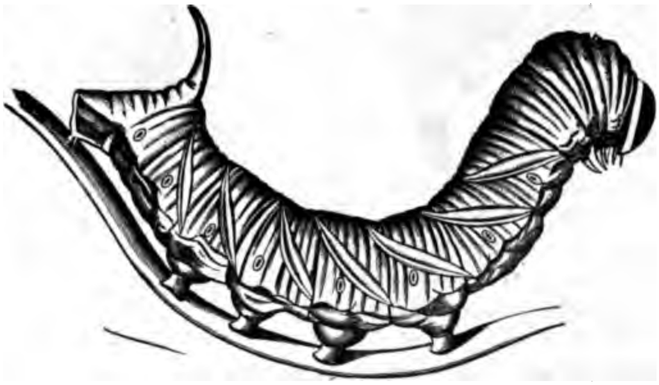

Fig. 54. Sphinx caterpillar.

The fruit of the raspberry is occasionally injured to some extent by the larvæ of the Raspberry Geometer, *Synchlora rubivora*, Riley, Fig. 55. This caterpillar is furnished on each segment with several short bristles, or spines, and has the habit of disguising itself, by at

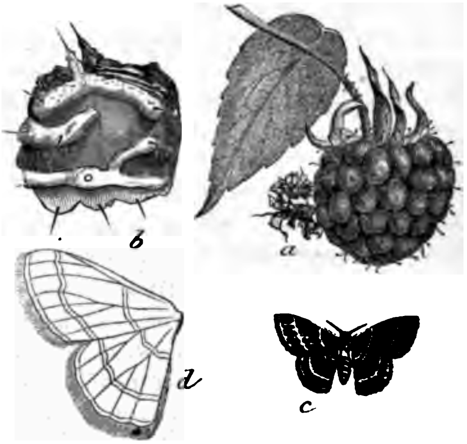

Fig. 55. Raspberry Geometer: *a* larva, natural size, on fruit; *b* segment, magnified, shewing hairs, etc.; *c* moth natural size; *d* pair of wings enlarged—colour pale green.

taching to these spines, very small bits of vegetable matter, such as the anthers of flowers, tiny pieces of leaves, etc. Owing to this habit it usually escapes detection. The curious larva of *Harrisimemna trisignata*, Walk, attaches pieces of its cast skin etc. to some long hairs on the front segments. When at rest the thoracic feet are drawn up close to the body and the front segments raised, giving it a very uncaterpillar-like appearance.

Although presenting sometimes a rather formidable appearance, with the exception of one or two kinds which are provided with irritating hairs, caterpillars are quite harmless. Some of the Sphingidæ will jerk their heads from side to side and even snap their mandibles, but they are unable to bite anything thicker than the edge of a leaf. The best known stinging larvæ are the pretty caterpillars of *Hyperchiria Io*, Fabr., (Fig. 56,) every point of whose mosslike covering is a poisoned dart, (Fig. 57,). Several of the slug caterpillars, as *Empretia stimulea*, Clem, are also able to leave unpleasant reminders when handled, (Fig. 58.) The hairs of the larvæ of the Brown-tailed moth *Euproctis chrysorrhea*, Linn, are likewise excessively irritating to the skin.

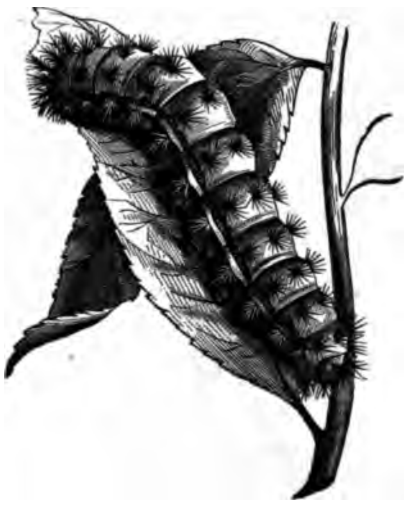

Fig. 56. Hyperchiria Io, caterpillar.

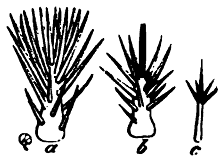

Fig. 57. Spines of Io, caterpillar, magnified

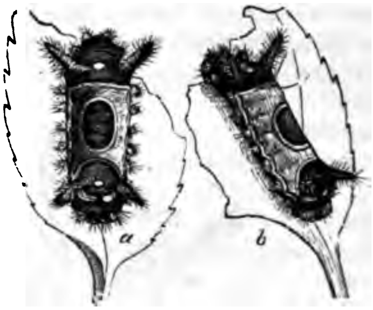

Fig. 58. Empretia stimulea caterpillars.

In conclusion the writer can only express the hope that this limited mention of some of these interesting habits may not be without some result, and that those who have never had the pleasure of watching the many habits of lepidopterous larvæ, may be led sometimes to take an interest in these creatures—the larval state of our butterflies and moths. Every species of caterpillar is worthy of study, and as so little is known of the preparatory stages of most of the lepidoptera, particularly of the moths, there is in this branch of study alone, a vast field for research. Many points doubtless of much value, even with regard to some of our common species which as larvæ, devastate our forest trees, fruit trees, and all kinds of crops, are yet to be discovered. Every little helps, and facts which may be considered worthless at the time often prove later on to be of great scientific value.

NOTES ON SEMIOPHORA YOUNGII, SMITH.

By Arthur Gibson, Ottawa.

In the report of the Dominion Entomologist for 1901, on page 251, mention is made of a new enemy to tamarac, or the American Larch (*Larix Americana*, Mx.) and the Black Spruce, (*Picea nigra*, Poir.), viz., *Semiophora Youngii*, Smith. This insect occurred in sufficient numbers in a large peat swamp near Ottawa to cause considerable destruction. A notice of this is also made in an account of "A Day at the Mer Bleue, Eastman's Springs, Ont." by the writer. (Rep. Ent. Soc. Ont. 1901.) During the past season further observations were made on the life-history of the species, but our knowledge of the habits of the insect is still far from complete.

On the 21st May, 1902, a trip was made to the Mer Bleue, by Mr. Young and the writer, but only a few larvæ, from half to three-quarters grown, could be found, and these were very local. At this point, owing to recent fires, the only trees on the swamp are small tamaracs and spruces from two to four feet high, and what larvæ we did find were all hiding in the wet moss at the base of the tamarac trees, a few inches below the surface. No specimens could be found near the spruce trees. A great many trees in other parts of the swamp were examined, but in only the one spot could specimens be found. In every case it was necessary to search in the moss at the base of the tree to find the larvæ as no noticeable injury to the foliage could be detected. The mature caterpillar is a handsome creature "about an inch and a half in length when full grown, of a rich velvety brown, with a ruddy or greenish tinge in different specimens, the dorsal area showing the richest colours, and bounded on each side by the white clear and threadlike lateral stripes; the dorsal stripe of the same intensity as the lateral stripes; the spiracles black and lying on the upper edge of a broad white substigmatal band, the lower surface much paler than the dorsal, the whole body finely mottled with small purplish brown spots. The centre of each segment on the dorsum is darker and more velvety than the intersegmental folds. The head is reddish brown finely mottled with lighter spots." (Fletcher.)

On the 18th September another visit was made to the locality in the hope of collecting some of the imagoes. At this time the moths of the Cranberry Looper, *Caterva catenaria*, Cram., were in great evidence—hundreds and hundreds of specimens in perfect condition. At almost every step four or five of these moths would arise from their resting places, and flutter away. Unfortunately, however, we were too late to secure good examples of the moths of *Semiophora Youngii*, Smith, but in all five specimens were taken, three by Mr. Young and two by the writer. These five specimens were in poor condition and were all collected at rest on small tamarac trees. Mr. Young put one of his specimens, a female, into a chip box, and secured some eggs, half of which he gave to the Division of Entomology. These were laid on the 19th Sept. and the young larvæ hatched out of doors on the 28th and 29th Sept. The following brief description was taken of Stage I—Head, brown. Body cylindrical, semitranslucent, pale greenish after feeding. Thoracic shield concolorous with head. Tubercles black and shiny. No markings on the body. The young larvæ loop when walking.

On the 16th Oct., in company with Dr. Fletcher and Mr. W. S. Odell, an enthusiastic microscopist, another trip was made to the Mer Bleue, and on this occasion two pupæ, of what we take to be *Semiophora Youngii*, Smith, were found by the writer, in the moss at the base of a small tree. One of these was dead, but the other contained a living, rather large hymenopterous parasite, almost fully formed, which could be distinctly seen moving inside. This pupa has been kept in a warm office ever since, but the parasite has not as yet emerged (1st Dec.) although still active inside the pupa.*

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* Since the above was written the parasite has emerged, and Mr. Harrington tells me that it is a species of *Anomalon*, ot previously taken here and unknown to him.

The same day Dr. Fletcher collected a small noctuid larva about half an inch in length in the wet moss at the base of a small tamarac tree. This looks very much like the caterpillar of *Semiophora Youngii*, Smith. It is still alive and is hibernating out of doors.

INSECTS INJURIOUS TO ONTARIO CROPS IN 1902.

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST.

The season of 1902 has been a rather unusual one in all parts of Canada. Exceptional rain fall has been recorded during the summer at almost all localities, and this has had a perceptible effect upon the abundance, or the reverse, of many of the well-known pests of the farm and garden, as well as upon the development of some of the staple crops. Late spring frosts were answerable for a considerable injury to grape and other fruit crops, including an affection of the leaves of apple trees generally referred to by correspondents under the term "yellowing of apple leaves," and also probably for a curious premature ripening of potatoes, which could not be referred to any of the known fungous diseases.

CEREAL CROPS.

In the Province of Ontario cereal crops were little injured by insects, the chief damage complained of being due to heavy rains. Rust was prevalent in many places, and complaints of lodging on account of heavy straw were frequent. Peas, which once formed such an important crop in Ontario, were little sown this season, owing particularly to the depredations of the Pea Weevil. The Pea Moth was less destructive than usual, and the Destructive Pea Aphis was only mentioned from a few localities, upon late peas and the grass pea. The grass pea, *Lathyrus sativus*, L., a pea-like plant belonging to the bean family, is not a true pea, but the seed resembles peas so much that it was hoped that, as this plant is entirely free from the attacks of the Pea Weevil, it might prove a valuable substitute for peas in those districts where the Pea Weevil is destructive. These hopes, however, during the past season have been disappointed, probably on account of the season; the grass pea, being of tropical origin, seems to require more heat than we have had during the summer of 1902. The seeds ripened unevenly, and the plants continued growing and flowering right up to frost. Late in the season in some places it was attacked by the Pea Aphis. However, in some seasons during the many years it has been grown, it has been known to give excellent crops, of from 10 to 30 bushels to the acre, of excellent peas, which can be used for most of the same purposes as real peas. Field peas, where sown late, were injured by mildew, and in the southern counties were seriously affected by the Pea Weevil. Beans were much injured by the weather. Late frosts in spring and heavy rains made re-planting necessary in a great many places. Fodder crops with the exception of corn, yielded heavily, but wet weather at haying time made it sometimes difficult to save the crop. There was a general complaint that clover did not form seed, even where there was no midge. Wheat and oats, our most important cereal crops, were of good quality and yielded heavily. A most satisfactory and unexpected condition prevailed throughout the whole province, as far as the Hessian Fly is concerned. This is largely due to farmers having followed the advice given by specialists as to the best means of avoiding injury from the attacks of this insect. Most farmers speak of its absence as "a most remarkable disappearance." The only serious injury by the Hessian Fly recorded in Canada this year was in Manitoba, where, however, as only spring grain is sown and as there is there only one brood of the insect in the year, as far as we know, the Hessian Fly can be kept in check with comparative ease. Grasshoppers were troublesome in some parts of western Ontario, where they also occurred last year They appeared again in destructive numbers in Manitoba, but wherever the Criddle mixture was applied, most satisfactory results followed. It will be well for farmers, should grasshoppers appear in Ontario again next year, to give this mixture a trial. It is a great improvement on the well-known poisoned bran mash, which has been so widely used against cutworms and also to a less extent against grasshoppers. Mr. N. Criddle, of Aweme, Man., noticed that grasshoppers were very much attracted to fresh horse droppings, and he at once tried substituting that material, which is always obtainable on farms without cost, for the, in Manitoba, very expensive bran. The results were so satisfactory that many of the farmers in his district used the mixture during the past summer and saved their crop. This mixture consists of one pound of Paris green mixed with sixty pounds of fresh horse droppings. To this is added two pounds of salt, and the mixture is then scattered broadcast around the edges of the fields by means of a trowel or wooden paddle. It is probable that even a weaker mixture than the above will prove effective.

The pea crop as stated above was a small one in Ontario this year. Few field peas were planted and these only in northern counties. This is due almost entirely to the prevalence of the Pea Weevil, more generally known as the "Pea Bug," which is by far the worst enemy of this important crop. It is indeed at the present time one of the most destructive enemies of farm crops, demanding the urgent attention of farmers in Canada and the United States. The pea crop is one of very great importance, and there is no other which quite takes its place for feeding. The loss is now enormous, probably nearly one million dollars a year in Ontario alone, and yet there is a simple and effective remedy, which is well known and may be said to be perfectly satisfactory in every way, as it is effective, easy of application and of comparatively small cost. A great effort is now being made to stir up public opinion in this matter and get some definite concerted action taken during the present winter and next year, so as to induce pea growers to follow the advice which has been so often given. It does not seem unreasonable to hope, in view of the peculiar circumstances of this case, that in one year a perceptible change might be made in the amount of infested and injured peas on the market, and, with this insect, more perhaps than with any other, total extermination seems a possibility if all will work together; but united action would have to be taken in all parts of Ontario and the northern United States where seed peas are grown. Many farmers have already given up growing peas, and others are talking of doing the same. The facts of this infestation and the problem which they involve, are simpler than is ordinarily the case with a pest of equal magnitude. The Pea Weevil, as a regular crop pest, only occurs in Canada in certain counties of Ontario, and there are still many places in the north where good peas can be grown free of this pest. The counties worst affected are those lying just north of Lakes Ontario and Erie. It is an exotic insect and has no native food plant, its only known food being the cultivated pea, which is also an exotic and will not winter over in this country. Every pea, therefore, which is sown in spring, has passed through the hands of seedsmen and others, and thus it has been possible at some time to treat this seed before it is sown. A remedy which is perfectly effective and easy of application by everyone with ordinary care, is to fumigate the seed before sowing with bisulphide of carbon. The large seed merchants, for this purpose have special buildings called "bug-houses" and practise this remedy regularly, finding it quite satisfactory; and, were it not for farmers and gardeners who grow a few peas for their own use and will not adopt the proper means of destroying the weevils before sowing their seed, there would be little difficulty in quickly bringing down the numbers of this destructive enemy. Now, however, some seedsmen who formerly fumigated their seed regularly, are omitting to do so, claiming that their efforts are useless all the time there are so many who do nothing. Although treated seeds may contain no weevils, yet in an infested district a crop grown from clean seed may still become infested by weevils which will fly in from the surrounding district, where seeds containing living weevils had been sown, or from insects which emerged the previous autumn.

The full grown Pea Weevil, is a small, roundish, very active beetle about one-sixth of an inch in length, greyish brown in colour and bearing two conspicuous black spots at the end of the abdomen above. (See figure). These beetles lay their eggs on the green pods ; from these, small white grubs hatch, which bore in and attack the nearest seed inside the pod. They penetrate by a minute hole which is afterwards almost obliterated by the growth of the increasing seed. There is only a single insect inside each seed, and it remains there until fully developed. This takes place perhaps, as an average date, by the middle of August, and, as a rule, most of the weevils remain in the seeds till the following spring. However, and this is one of the greatest difficulties in getting a perfect remedy for the Pea Weevil, some of the beetles, in certain seasons a large proportion of them, leave the peas in autumn and pass the winter about barns, buildings, etc. This makes it necessary to reap and thresh as soon as possible, so that the seed may be treated before the weevils leave it. Some of the best seed dealers have for years been urging upon growers the importance of this and have sent out printed circulars to their customers, offering a higher price for seeds delivered by a certain date, so that the injury may be as little as possible ; the grain, being harvested before it is dead ripe, is also of better quality and germinates better. Efforts will be made during the coming winter to have this matter fully discussed at all the farmer's meetings in the Province. I am convinced that this problem of stamping out the Pea Weevil entirely, is a matter of possibility if farmers and seed merchants will only work together for a short time and carry out the instructions given. The Pea Crop of Canada is far too important for farmers to give up growing it, nor do I think that this would be a wise course to adopt, until a much greater effort has been made to get farmers to use the common sense plan which has proved so successful with those who have tried it. An old and well-tried remedy is to hold over seed peas till the second year before sowing. The beetles will emerge the first spring and will die inside the bags. Another good plan is to treat the seed with coal oil 1 gallon to 20 bushels of seed, turning the seed thoroughly with a shovel every day for 4 or 5 days.

Root Crops.

There has been a noticeable absence of some of the destructive enemies of root crops. The Turnip Aphis has hardly appeared. The Cabbage Butterfly, which last year was so injurious to cabbages, turnips and rape, has been very much reduced in numbers by bacterial and insect parasites. The Colorado Potato Beetle was troublesome where neglected, but is easily kept in check with the ordinary poison applications. The advisability of applying Paris green or some other poison in Bordeaux mixture has been demonstrated this year, when the Potato Rot has very much reduced crops which were not protected by this useful remedy. The Bordeaux mixture, consisting (for potatoes) of 6 lbs. of copper sulphate, 4 lbs. of fresh lime and 40 gallons of water, as a remedy for this terribly widespread and destructive disease, is one of the greatest triumphs of modern applied science. It always pays to apply it to growing potatoes to protect them against various fungous enemies, and it has been found that the ordinary poisons which destroy insects may be applied mixed with the Bordeaux mixture, without lessening the effect of either. The Gray Blister-beetle, *Macrobasis unicolor*, Kirby, was reported from a few places, but no serious injury was done, and it must be remembered that the occurrence of these beetles in large numbers indicates that many locusts have been, or will be, destroyed, because the larvæ of the blister-beetles feed entirely upon the eggs of grasshoppers. Asparagus Beetles occurred in numbers in the Niagara Peninsula, and have spread somewhat during the past year. The remedies most relied on are dusting larvæ freely with freshly slaked lime, collecting the beetles in beating nets and applying poisoned sprays to the food plant.

As a consequence of the wet season, Slugs have been more abundant than usual, and several complaints have been received of their injuries to root crops and various garden plants. These molluscs are seldom troublesome, except in damp places or in wet seasons. The best remedy is to dust plants lightly for three or four consecutive evenings, just at dew fall, with freshly slaked lime, which adheres to the viscid coating of the slugs, and causes them great discomfort, as is shown by the copious out-pouring of the slimy secretion. After two or three applications the animal loses the power of producing slime and dies. The lime has no injurious effect on plants and indeed is beneficial on many lands. When these creatures, as is sometimes the case, give trouble in greenhouses, lime or salt may be dusted between the flower pots on the benches ; a good bait which attracts slugs and snails very much, is bran damped sufficiently to make it adhere. A very small quantity of Paris green may be added to this and will soon clear out the marauders. In greenhouses the poisoned bran or oat-meal may be placed on slips of glass, which can be put out at night and removed during the day.

FRUIT CROPS.

The fruit crops of the province have been on the whole satisfactory, although irregular. In some places heavy yields were secured, but in others there was a shortage. The ordinary insect enemies have been less abundant than for many years, but fungous diseases, particularly the Black Spot of the Apple, have caused loss in most districts, and in a few places the Sooty fungus, *Labrella pomi*, has appeared. This produces on some varieties, particularly Rhode Island Greenings, an unsightly appearance which is known in the trade under the name of "Clouded Fruit." There has been a remarkable absence of injury from the Codling Moth, Cankerworms and Tent Caterpillars. Plums are reported as a light yield, owing to late spring frosts and excessive rain. Where spraying has been neglected, great injury has been done by the Plum Curculio and the Plum Rot has been more prevalent than for many years. This fungus every year destroys enormous numbers of peaches and plums, and the dried mummified fruit may frequently be seen in orchards otherwise well cared for. It is a most important part of the remedy for this disease, to gather, from the ground when they fall and from the trees after they have dried up, the diseased fruits, because in these is found the most fertile source of infestation of the crop of the following year. All should be burnt before the spring opens, and the trees should be sprayed carefully just after blossoming with poisoned Bordeaux mixture, which will have the double effect of checking the fungus and preventing injury by the Plum Curculio. The absence of so many of the regular enemies of the orchard must be due in a large measure to the season, but also certainly to the increasingly large number of fruit growers who now carry on their work in a scientific practical manner, spraying thoroughly and using the remedies which experience has shown are the proper ones for the different pests. The word "spraying", however, to many who endeavor to practise this operation, has still little more meaning than doing something, in any sort of a way, to fruit trees with a spraying pump. It cannot be too often insisted upon, that spraying is the operation of applying by means of a force pump and spraying nozzle a special liquid mixture, which varies according to the habits of the insect to be treated, with such force as to break up the liquid so thoroughly that it falls upon the plants treated as an actual mist or spray. Such terms as "sprinkling" and "showering" are inaccurate for the operation intended. Undoubtedly, much of the so-called spraying, as usually done, would be more accurately designated by these terms which describe a much less careful and less even distribution of liquids. The Eye-spotted Bud-moth has been rather troublesome in apple and plum orchards, particularly in the eastern counties and down through the Maritime Provinces.

The subject of the injurious Scale Insects of the orchard, to which so much attention has been directed of recent years, owing to the unfortunate introduction into our province of the San José scale, has done much to show the value of a practical knowledge of Entomology.

This has been brought prominently before the fruit growers of Canada by means of the magnificent work which has been carried on by the Honourable John Dryden, Minister of Agriculture for Ontario, through two members of the Council of our Society, Mr. Geo. E. Fisher and Prof. Lochhead, whose efforts have been well seconded by the nurserymen of the province, who have been most assiduous in conforming to all requirements which the Minister thought it wise to impose. As a consequence of this, the condition of orchards, as far as other scale insects and various other pests are concerned, is actually better than it was before the advent of the San José scale. The standard remedies for scale insects, kerosene emulsion and whale-oil soap solution, are now pretty well known and generally adopted. The Oyster-shell Bark-louse, next to the San José scale, is the one which does most harm. Where this occurs upon trees in the San José scale district, it is, of course, destroyed at the same time as that scale, when trees are treated with the drastic measures which have been found necessary. When trees are found to be infested by the Oyster-shell Bark-louse (Fig. 59), the proper steps to take are to spray the trees early in the winter with a simple whitewash containing one pound of fresh lime in every gallon of water. Two applications should be made, the second wash may be applied as soon as the first is dry. In spring invigorate the trees by spudding in a light application of well rotted manure around the roots, and during the summer spray the trees, at the time the young scale insects hatch, with kerosene emulsion or a whale-oil soap solution. For the San José scale the latest results obtained by Mr. Fisher have proved that this insect can be controlled by spraying infested trees early in spring with the California Lime-Sulphur and Salt wash, which Mr. Fisher has modified—he thinks, with equally good results—by omitting the salt. This treatment must be followed during the summer by spraying with kerosene emulsion. I have visited Mr. Fisher's experimental orchards several times and have seen the excellent results which he has secured; these are certainly a monument not only to his great perservence but to the foresight of the Provincial Minister of Agriculture, under whose instigation the many and various experiments carried out by Mr. Fisher were made.

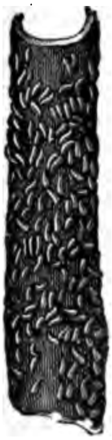
Fig. 59.—Oyster-shell bark louse on a twig.

In some orchards at Queenston and Niagara there are some interesting occurrences of the Plum Gall-mite, *Cecidoptes pruni*, Am., which are now receiving experimental treatment. The small round galls are clustered around the twigs and increase in numbers very rapidly. The injury to the tree is not very apparent at first, but ultimately the twigs are destroyed. The extremely small mites live in large numbers inside the galls, which are only one-sixteenth of an inch in diameter. There is apparently no opening to them except just at the time the mites emerge. Applications sprayed over the trees have so far proved unsatisfactory. Mr. Fisher has tried fumigating with hydrocyanic acid gas, and, although at first this was apparently successful, many of the mites certainly being killed, later examinations have shown that it is not a satisfactory remedy.

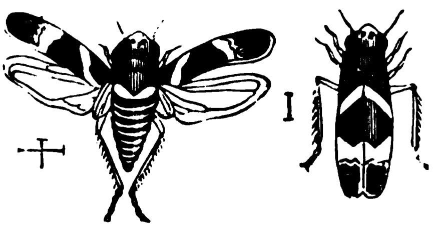

Fig. 60.—Grape-vine Leaf-hopper, much magnified.

The Grape-vine Leaf-hopper (Fig. 60), has done considerable harm in some vineyards in the neighborhood of St. Catharines, and experiments have been carried on with a view of getting a practical remedy for these troublesome insects, well known among growers as "the thrip." The most serious injuries by this leaf-hopper are its attacks upon the Virginian Creeper, where used upon houses and arbours.

The Apple Aphis has been rather more destructive than usual, and it has been found necessary towards the end of the season to advise the spraying of trees, when it was very abundant. This is seldom the case in Ontario, although a regular thing in British Columbia, where it is very destructive every year. Apples were seen during the past summer in Prince Edward Island, which were seriously injured by this insect ; where the fruit was punctured, deep pits were left, giving the fruit a distorted and gnarled appearance, which rendered it quite unsaleable. This injury probably took place when the apples were very small. The Cherry Aphis appeared in very large numbers early in the season in western Ontario ; but later there was little sign of the insect upon the trees, and its injuries were hardly noticed. It is significant that just before the disappearance of these plant-lice one of the severe frosts, already referred to, occurred, and it seems possible that this may have been answerable for the disappearance of the plant-lice. It was not, however, the only cause, for a week later many of the insects were found in some orchards in the same localities.

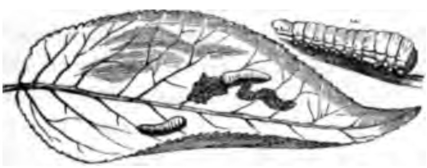
Fig. 61.—Pear-tree Slug : *a.* magnified.

The Pear Slug, *Eriocampa cerasi*, Peck (Fig. 61), was abundant in some places and did a great deal of harm by destroying the foliage of plum, cherry and pear trees. This pest seems to be very generally ignored by fruit growers and, as a consequence, it often levies heavy tribute. The autumn brood, skeletonizing the leaves, prevents them from performing their functions and thus the crop of the following year suffers.

White Grubs (*Lachnosterna*) were complained of as troublesome in strawberry beds, as well as in potato fields and pastures. There is no good practical remedy for these insects when occurring on farm crops. Where land can be ploughed up, this should be done in August, so as to disturb the pupæ which in many species form at this time, and are very tender. The life history, as generally accepted, is that the eggs are laid in June and the young larvæ feed until August of the following year, when they pupate and assume the perfect form. The beetles, however, do not then emerge but remain in their earthen cells until the following May. When strawberry beds are attacked, undoubtedly the best remedy, which, I think, was first suggested by Mr. P. C. Dempsey, of Trenton, is to adopt the one crop method ; this consists simply of planting out the new strawberry sets in spring or the previous August, and then taking the crop the next spring. As soon as such runners as are required for propagation are secured, the beds should be plowed up. White Grubs are most destructive in old beds, and, by adopting this method which also, horticulturists claim, gives the most paying crops, the insects are prevented from making headway.

Two interesting occurrences of the fungous parasite, *Cordyceps melolonthæ* (Fig. 62), came to my notice during the past season, one at Ottawa, reported by Mrs. Brown and Miss Lees, the other at Renfrew, by Mr. W. J. Kerr. These outbreaks of this beneficial fungus, although occurring rarely, as a rule, reduce the numbers of the white grubs rapidly and perceptibly where they occur.

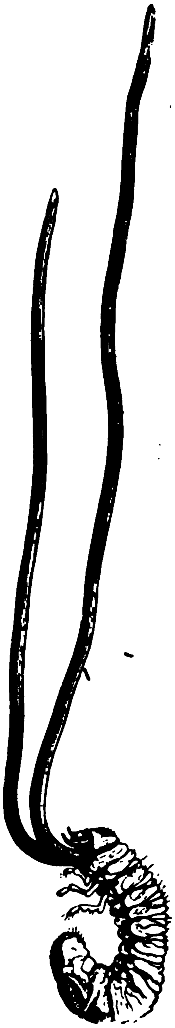
Fig. 62.—White-Grub fungus.

Two comparatively new fruit pests which require attention from fruit growers, are the Blackberry Soft-scale (*Lecanium Fitchi*), which has appeared in destructive numbers upon cultivated blackberries in western and central counties, and the Rose Scale (*Diaspis rosæ*), which attacks the rose and the blackberry. In the latter case, it frequently occurs with the Blackberry Soft-scale. This latter has a conspicuous dark brown polished scale about ⅛ inch in diameter, hemispherial in shape, and is frequently so thickly clustered on the canes as to cover portions of them entirely. Like many other scale insects, it increases most rapidly on old or worn out plantations, and is very much attacked by both fungous and insect parasites.

The Rose Scale is much smaller and flatter. The color is clear white, and the females are circular in outline, while the males are elongated. When abundant, they give the infested plants the appearance of having been finely spattered with lime. The remedy for both of these insects is to plant new plantations from healthy beds, or to prune severely and spray early in spring with kerosene emulsion or whale-oil soap solution.

A possible enemy of the apple may be mentioned, although as yet little is known of its injuries. Last autumn I found at Ottawa three small green larvæ of a saw-fly, in cells eaten about half an inch deep into the sides of apples. The walls of the cavities were white and dry, and the orifice was closed with debris gnawed from the apple, but there was no appearance of excrement in the cavity. The mouths of the orifices, however, were hardened and of a greenish hue as though they had been made before growth had ceased. These larvæ produced last spring the common Saw-fly (*Taxonus nigrisoma* Nort). It seems probable to me that the larvæ may merely have gnawed holes into the apples as presenting a convenient place for pupation ; but, as the three larvæ were in different apples from distant parts of the orchard, and all found by chance, it is just possible that they may have been abundant, and that we may have in future to deal with a new enemy of the apple. In England there is a saw-fly which causes considerable loss in the apple crop. These Canadian larvæ resemble very closely a species which is frequently abundant on docks, and some species of Polygonum riddling the leaves in autumn. I regret to say I took merely a superficial description of the larvæ before they pupated. I shall be glad to hear if anyone else has noticed this attack.

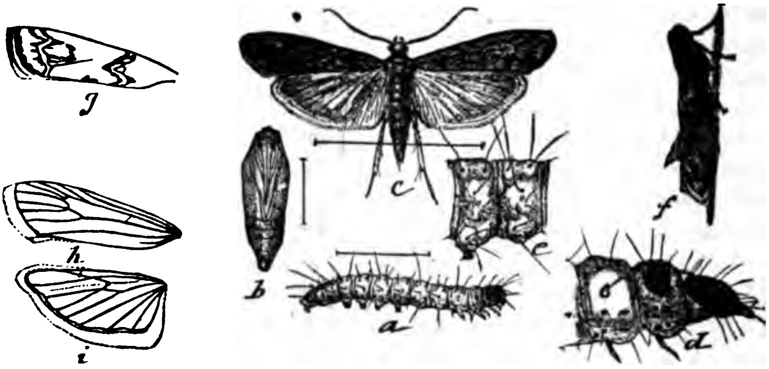

Fig. 63.—The Mediterranean Flour Moth.

The Mediterranean Flour Moth (Fig 63). An insect which has spread rapidly through Canada of late years, but of which little is said, is the above named which is a serious pest of many of our Canadian and American flour mills. Far greater care than has been practised in the past will have to be exercised by millers in keeping their premises clean and constantly swept out, before this pest is controlled. Millers, however, now understand the habits of this insect and the best means of checking its increase. In my own experience, thorough fumigation with sulphur has given the best results, accompanied with constant cleaning up, and in winter throwing open the mills to the full intensity of the winter weather. This, if, as some claim, it does not kill the larvæ, at any rate prevents them from developing so quickly, and probably from breeding for long periods. Two different parasites have been bred by me in large numbers during the two past years from infested mills. One of these, from Rockland, Ont., has been named *Idechthis ephestiæ* by Mr. W. H. Ashmead, the other is probably an undescribed species, and was received from Moulinette, Ont., where it occurred in such numbers as to attract the attention of the men in the mill and obtain a popular name, "the red-tailed fly."

The Buffalo Carpet Beetle (see Fig 31) has spread largely during the past summer, and now occurs as a household pest not only in western Ontario, but as far east as Ottawa. In the Province of Quebec it is found in the eastern townships, and in Nova Scotia there is another colony in the Annapolis valley. Housekeepers should use every effort on its first appearance to clear this destructive insect out of their houses. Carpets should be taken up and beaten thoroughly out of doors, the floors mopped with scalding water, and, before replacing the carpets, strips of tarred paper should be placed round the edges of rooms. All cracks in the floors after brushing out thoroughly should be sprayed or sprinkled with gasoline. Anyone suffering from the presence of this pest will do well to look up the articles which have appeared upon this subject in our reports, or I shall be pleased to give full particulars as to treatment to anyone who will apply to me on this subject, or concerning any other injurious insects.

An allied insect *Attagenus pellio* has also been reared from larvæ which were destroying carpets at Wolfville, N.S., and which were kindly forwarded to me by Mrs. M. G. DeWolfe.

ENTOMOLOGICAL RECORD, 1902.

By Dr. James Fletcher, Ottawa.

Since the appearance of the Entomological Record of 1901, many letters have been received, not only from Canadian students, but also from specialists in the United States, testifying to its value for the purposes for which it was prepared, viz. (1) to give the names and addresses of Canadian workers in the various orders of insects and of specialists who will help others working at the same subjects; (2) to record species not previously published as occurring in Canada; (3) to give exact data as to the distribution of species, together with dates when certain insects have been captured, so that places may be visited and desirable species sought for at the time and place where they are known to have occurred; (4) to draw attention to works of particular value in the different departments of Entomology; and (5) to place on record anything which it is thought will affect the progress of the study of the insects of the Dominion.

A great many notes of captures have been received, and, from these, selections have been made for mention of such species as, in the opinion of the writer, seemed worthy of recording. Great care has been exercised in endeavoring to arrive at correct determinations, and some species which have been reported have been for the present omitted until further light has been received

One gratifying feature has been very marked, viz. the encouragement which has been afforded to beginners and collectors living in isolated or distant localities, from bringing them into correspondence with specialists elsewhere, concerning interesting species which they have been fortunate enough to take. As a consequence, a considerable amount of exchanging has been arranged during the past year, which has been mutually advantageous to those concerned. Some species which were generally thought to be exceedingly rare, have proved, by references in last year's Entomological Record, to be merely species with restricted localities, which may occur in some abundance in those localities, easily obtained by those living there and supplying them with a valuable means of obtaining from others many species to them more desirable in exchange. I find from my correspondents that there has been a most gratifying increase in their correspondence concerning Canadian insects. In this way, many students who would never have known of each other's existence, have been brought together, and there has been a consequent increase in the knowledge of Canadian insects and their distribution. Some have expressed their appreciation of the fact that they now feel that they can do effective work as factors in one large system with a definite end in view. This feeling has induced a few to ask advice as to the choice of some special line of investigation, which would be of particular use to the science of Entomology in Canada. I believe that in 1903 more special work will be done in the Dominion than has ever been done before. As in the past, invaluable assistance has been rendered to Canadian collectors by experts in the United States and Canada. As much of the initial correspondence has passed through my hands, I must particularly express gratitude to Dr. L. O. Howard, Dr. Harrison G. Dyar, Mr. D. W. Coquillett, and Mr. W. H. Ashmead, of Washington; Dr. J. B. Smith, of New Brunswick, N. J.; Dr. H. Skinner, of Philadelphia; Dr. Wm. Barnes, of Decatur, Ill., who spent some weeks in British Columbia and visited Alberta last summer, when he called on several of our Western members thus encouraging and assisting them very much by identifying many species seen in their collections; Mr. E. P. Van Duzee, of Buffalo; Mr. H. Bird, of Rye, N.Y.; Prof. H. F. Wickham, of Iowa City, Iowa; and Mr. W. H. Harrington, of Ottawa, all of whom have been most kind and patient in identifying species whenever submitted to them. I am pleased that, in almost all instances, Canadian collectors have gladly given specimens to these specialists upon a suggestion that they would be acceptable. When an expert authority who has gained his knowledge after many years of close study, takes the trouble to go through a large number of specimens and name them, sometimes at the expenditure of much time, the least that can be done is to make a great effort and considerable sacrifice to provide him with any specimens which he may indicate as desirable. I presume here also to remind my readers that they should be very careful to remember that return postage has to be paid by these gentlemen, but that they will very seldom mention this. The amount of postage on parcels returned may be seen by examining the postage stamps on the wrappers, and this or its equivalent should be scrupulously returned. Specimens of undescribed species, even when uniques, are useless in a private cabinet, and, when these are described by a specialist, he should at any rate have the privilege of retaining them. Such specimens when deposited in the collection of a recognized authority, are where they may be of benefit to a very large number of working entomologists, but when hidden away in a private collection they are practically useless. This should indicate the very great importance of entomologists depositing in National Museums, or in the cabinets of Societies, like our own, where there is a regular curator, specimens of great rarity, or such as are of particular interest, not only for the reason that they may be of use to the greatest number possible but also to preserve them from destruction more effectually than is possible in any private collection. When a new species is submitted for description, as full a series as possible, and of specimens in the best condition obtainable, should always be sent. Unfortunately, it is too common a practice to send a poor specimen for identification. This is largely done of course to avoid the danger of destruction in the mails; but, if specimens are firmly pinned, supported where necessary with cotton wool, and carefully packed with plenty of soft material between the box containing the specimens and the outside wrapper or box, they may now be sent with comparative safety. In the case of lepidoptera specially prized, specimens should be relaxed, taken from their pins, and put in papers for transmission by mail.

During the past year I have learnt of several more naturalists in different parts of Canada, who are working at various orders of insects. Some of these are connected with the public schools of the country, in which Nature Study has recently been recognized as an important part of education. In British Columbia the British Columbian Entomological Society, with its headquarters at Vancouver, and with a most energetic secretary in the person of Mr. R. V. Harvey, and the Rev. G. W. Taylor as President, has done excellent work during the past year in working up the insect fauna of the province. The Society has already issued three lists containing the names of such species of lepidoptera as have been identified, and similar lists of the other orders are to appear. Quarterly meetings are held for the exhibition of specimens at various centres, and a monthly serial in manuscript is circulated, giving the experiences of the different members for the previous month. Notes upon captures, upon insects identified, and on methods and arrangement of collections, on the rearing of larvæ etc., are added by each member upon blank sheets, and the number is then passed on to the next in order. The North-west Entomological Society, which owed its existence to the enthusiasm of Mr. Percy B. Gregson, of Blackfalds, Alta., has done such good work that it drew sufficient attention to itself for a public meeting to be called in Calgary, where its scope was extended and the name of the Society changed to the Territorial Natural History Society, with the following objects:—To instruct farmers as to the nature of beneficial and injurious insects, weeds and birds, and to establish natural history museums at central points in connection with schools, etc. Arrangements have already been made to establish museums of natural history at Blackfalds, Lacombe, Calgary and Regina. The last of these will be in the care of Mr. T. N. Willing, the Territorial Government Weed Inspector, who is a keen observer and enthusiastic naturalist. Mr. Willing is also the secretary of the new Society.

LITERATURE.

Bibliographical notes on entomology have appeared regularly as usual in entomological journals and scientific magazines, and a Bibliography of Canadian Entomology is prepared annually for the Royal Society of Canada by Dr. C. J. S. Bethune, and appears in its transactions. The Canadian Entomologist (London, Ont.), Le Naturaliste Canadien, and the Ottawa Naturalist are indispensible to the working entomologist. The same also must be said of the American Naturalist, Entomological News, Psyche, Journal of the New York Entomological Society, Transactions of the Amer. Ent'l. Soc'y. and Science. In these publications every book of importance is noticed, and there is no necessity here to make particular mention of many works of a general nature which have appeared during the past year.

I would, however, direct attention to "Caterpillars and their Moths" by Miss I. M. Eliot and Miss Caroline G. Soule. This is a charming book, written in an attractive style, which illustrates on every page the great fascination there is in rearing insects from the egg and also how important discoveries may be made by close observers, even in the case of well known insects. The clear descriptions of methods, and hints on breeding, will be found very helpful, even to many who have had considerable experience in this work.

"The Common Spiders of the United States," by J. H. Emerton. This makes accessible a new field of study in a subject of great interest to everyone. The book is well illustrated and each of the 200 or more species is figured and described in simple language. It is a welcome addition to our literature.

"The Book of Bugs," by Harvey Sutherland. Notwithstanding the title, which will perhaps deter some from examining it, this book, which is written in a novel, racy style, will induce all who open it to read on and on to the end, and in doing so they will obtain many useful and accurate facts concerning several common insects and some bugs. It will also probably commend itself to a class of readers who will be benefited by the information given and who might not be reached by the ordinary works on entomology.

SPECIALISTS.

It is to be hoped that now this record provides a means of bringing collectors in all parts of the country into correspondence, some of those, who make general collections including all orders, may specialize their studies more, so that, while not giving up their general collection, they may make a particular study of some one order. A few have recently signified their determination to do this, and the specialists mentioned below will be glad to correspond with collectors concerning the insects mentioned in connection with their names. Canada is so large that specialists are urgently needed in every Province of the Dominion, not only of orders, but also of families, or even separate genera. The lepidoptera and coleoptera have always been fairly well worked, but specialists in the other orders are few, notwithstanding the good work which doubtless can be done. The hymenoptera, diptera, and hemiptera have a few devotees, but many of the other orders are almost entirely neglected. The orders which perhaps most demand attention at the present time, are the orthoptera and the neuroptera. It is strange, in view of the enormous damage sometimes done by locusts, that so few students have devoted attention to them. The odonata also offer an almost unworked field for original research. It is to be hoped that, before long, some will take up these orders more energetically than has been done in the past.

As a matter of course the reference collections, including all orders of insects of the Entomological Society of Ontario, at London, of the Division of Entomology, at Ottawa, and of the Agricultural College at Guelph, are being added to continually. To the best of their ability the officers at the Division of Entomology, at Ottawa, will name, or get named, insects in all orders, and will be glad to help or advise in any way in their power all applications for information concerning insects.

Collectors in the field have frequent opportunities of catching insects belonging to other orders than those which they study. I would point out that very little trouble is required to pin such specimens without setting them, and attach a label with the date and locality. These may then be put on one side in a cigar box, to be sent when convenient to specialists. In this way, with little labour great service may be done to entomology. If Canadian collectors will save specimens as suggested and forward them to me (parcels and letters concerning insects may be sent to me without postage), I shall be pleased to forward them to any specialists they may designate. The information conveyed with these specimens as to the distribution and date of occurrence of insects will be of great value in the official work of the Division of Entomology, and collectors will be at no expense for postage.

The following are making special studies :—

LEPIDOPTERA.

Rearing from the egg. Messrs. Lyman and Brainerd, of Montreal, Rev. Dr. Fyles, Quebec, Messrs. C. H. Young, Hurdman's Bridge. A. Gibson, and J. Fletcher, Ottawa, J.W. Cockle, Kaslo, B. C.

Diurnals. H. H. Lyman, Montreal, J. Fletcher, Ottawa, F. H. Wolley-Dod, Millarville, Alta

Nocturnals. The Genus Hydrœcia, Messrs. A. F. Winn and H. H. Lyman, of Montreal, and J. A. Moffat, of London. The genus Apantesis (Arctia) A. Gibson, Ottawa. The Genus Carneades, F. H. Wolley-Dod, Millarville, Alta. The Geometridae.—Several collectors have agreed to make a special study of the geometers. The Rev. G. W. Taylor on the Pacific Coast and Mr. W. McIntosh, on the Atlantic seaboard, and the Division of Entomology of the Government Experimental Farm at Ottawa, have already begun a critical study of these moths. Messrs A. W. Hanham, and E. F. Heath have made large collections of the geometers of Manitoba. It is a favourite group with Mr. Hanham, who now lives at Victoria, and he will doubtless help in working up the Vancouver Island species. The Rev. G. W. Taylor, at a recent meeting of the British Columbia Entomological Society, showed four drawers of geometers containing 700 specimens representing 144 good species, nearly all of which had been taken this year at Wellington, B. C. Mr. Cockle has collected geometers assiduously in the Kootenays, and so much work on these interesting moths is now in progress that I have decided to hold over all references to captures in this family until next year's Record, when it is to be hoped that Dr. Dyar's anxiously looked for catalogue of the lepidoptera of North America, will have apppeared. In the same way, it is perhaps advisable, in the meantime, not to record the varous species of Hydræcias which are being studied by many, as new light is daily being received, particularly through the excellent work of Mr. Henry Bird, of Rye, N. Y., in rearing the species from their food plants.

COLEOPTERA.

Our highest authority in this order is Mr. W. H. Harrington, of Ottawa. Mr. R. J. Crew, of Toronto, who has for many years done good work, is devoting special attention to the Pselaphidæ. Mr. J. D. Evans, of Trenton, is making a critical study of the genus Lachnosterna. And Mr. E. P. Venables, of Vernon, B. C., is going to devote his time specially to beetles.

HYMENOPTERA.

Mr. Harrington again is our leading authority in this order, and is constantly naming material. The hymenoptera of the Okanagan Valley in British Columbia, will be specially collected by Mr. Venables.

I have requested Mr. W. H. Harrington to prepare the record of hymenoptera for 1902, which he has kindly done. It would certainly be advantageous if each Order could be treated of by some one who is working specially upon it, and in future this may perhaps be arranged.

DIPTERA.

Large collections have been made by Mr. Harrington, at Ottawa, and Mr. G. Gagnon, at Montreal. Mr. Venables has collected many species of Tabanidæ at Vernon, B.C. Next season, Mr. W. McIntosh, of St. John, N. B., intends to devote much time to this order.

HEMIPTERA

Mr. W. H. Harrington has for many years collected these insects, and has named much material for correspondents. He has also published in the Ottawa Naturalist a list of the Ottawa species. During the past summer the Rev. G. W. Taylor has been studying the Vancouver Island forms with the help of Mr. E. P. Van Duzee, of Buffalo, and has collected this year about 125 distinct species. Mr. C. Stevenson, of Montreal, will study the heteroptera of the Island of Montreal, the Rev. T. W. Fyles, the scale insects of the Province of Quebec, and Prof. Lochhead, those of Ontario next season.

ORTHOPTERA.

Mr. E. M. Walker, of Toronto, is so far our only authority in this order. In the west Mr. Norman Criddle, at Aweme, Man., and Mr. T. N. Willing, at various points in the North-west Territories have collected material, which has added much to our knowledge of these insects.

THE SEASON OF 1902.

The wet dull season of 1902 in all parts of Canada has been very unpropitious for the collector of insects. The persevering collector, however, has as usual added little by little to his collection by constantly being on the alert. A few records of remarkable catches on certain evenings have been received from lepidopterists. Mr. E. Firmstone Heath, of Cartwright, Man., mentions May 22, as such, and Mr. A. J. Dennis, of Beulah, Man., had an exceptional experience of the same kind on June 11 ; Mr. J. D. Evans, of Trenton, Ont., and Mr. C. H. Young, of Hurdman's Bridge, Ont., also report good occasional nights, but in most places the season of 1902 must be characterised as exceptionally poor. Many of the well known crop pests were also noticeably less abundant than usual.

The following list gives the names of the most active workers in Canada which have been heard from during the past year. There are doubtless many others, but I have not heard from them during 1902. The initials in parentheses after their names indicate the orders they are studying, or if they have general collections.

Anderson, E. M., Victoria, B. C. (L.)
Bethune, Rev. C. J. S., London, Ont. (Gen., L., C.)
Bégin, Rev. P. A., Sherbrooke, Q. (Gen.)
Bice, J., London, Ont. (L.)
Baird, Thomas, High River, Alta. (Gen.)
Browne, Edgar J., London Ont (L., C.)
Brainerd, Dwight, Montreal. (L.)
Bryant, Theodore, Wellington, B. C. (L.)
Bush, A., Vancouver, B. C. (L.)
Chagnon, Gus., Montreal. (D., C.)
Cockle, J. W., Kaslo, B. C. (L.)
Criddle, N., Aweme, Man. (L., Or., C.)
Crew R. J., Toronto. (C.)
Dennis, A. J., Beulah, Man. (L.)
Desrochers, Rev. J. E., Rigaud, Q. (L., C.)
Dod, F. H. Wolley-, Millarville, Alta (L.)
Draper, R., Vancouver. (L.)
Evans, J. D., Trenton, Ont. (Gen., L., C., Hym.)
Fletcher, Dr. J., Ottawa. (Gen., L., C.)
Fyles, Rev. Thos. W., Levis, Que. (Gen., L., Hym.)
Gibson, Arthur, Ottawa. (L.)
Grant, C. E. Orillia, Ont. (L.)
Gregson, P. B., Blackfalds, Alta. (Gen.)
Hanham, A. W., Victoria, B. C. (L., C.)
Harrington, W. H., Ottawa. (C., Hym., Hem., D.)
Harvey, R. V., Vancouver. (L., Odon.)
Heath, E. F., Cartwright, Man. (L.)
Huard, Rev. Victor. Quebec. (Gen.)
Jones, W. A. Dashwood, New Westminster. B. C. (L.)
Lochhead, Prof. W., Guelph, Ont. (Gen., Or.)
Lyman, H. H., Montreal. (L.)
McIntosh, W., St. John, N. B. (L., D., C.)
MacLaughlin, T. J., Ottawa. (Odon.)
Marmont, L E., Rounthwaite, Man. (L.)
Metcalfe, W., Ottawa. (L., C.)
Moffat, J. A., London. (L.)
Parsons, C., London. (L., C.)
Perrin, Jos., Halifax, N. S. (L.)
Norris, A. E., Montreal. (L., Hem.)
Ouellet, Rev. C. J., Montreal. (C., Hym.)
Richard, A. E., Ottawa. (L.)
Roy, Rev. Elias, Levis, Q. (C.)
Sandercock, W. C., Lauder, Man. (L.)
Simpson, Willibert, Ottawa. (C.)
Suffield, J. D., Morden, Man. (L.)
Sanson, N. B., Banff, Alta. (Gen., L.),
Schmitt, Dr. J., Anticosti. (Gen.)
Stevenson, Charles, Montreal. (L., Hem.)
Tanton, J., London, Ont. (L.)
Taylor, Rev G. W., Wellington, B. C. (L., Hem., C.)
Venables, E. P., Vernon, B. C. (L., C., Hym.)
Walker, E. M., Toronto. (Or. Odon.)
Winn, A. F., Montreal. (L.)
Wilson, E., Vancouver. (L.)
Wilson, Jno., Vancouver (L.)
Wilson, T., Vancouver. (L.)
Williams, J B., Toronto. (L.)
Willing, T. N., Regina. (L., Or., C.)
Young, C. H., Hurdman's Bridge, Ont. (L.)

NOTES OF CAPTURES.

LEPIDOPTERA.

(*Arranged according to Smith's List of the Lepidoptera of Boreal America.*)

RHOPALOCERA.

Argynnis idalia, Dru. Aweme (Criddle).

Argynnis astarte, Db.-Hw. Sulphur Mountain, Banff, 27 June; (Sanson). Mountain just above Lake Agnes, Laggan, B. C., 18 Aug. (Dr. W. Barnes).

Argynnis triclaris, Hbn. Nepigon, 12 July. Not previously taken at this locality. The specimen was a female from which about a dozen eggs were obtained and the larvæ were carried to hibernation. Food plant, *Viola eu-cucullata*. (Fletcher).

Melitæa Harrisii, Scud. Abundant, Halifax, N. S. (Perrin).

Grapta gracilis, G. & R. Anticosti, (Dr. J. Schmitt).

Cœnonympha inornata, Edw. Several specimens of this little satyrid have been taken during the past summer in localities very distant from previous records. Rockcliffe, Ottawa, near the Rifle Range, 14 June, (Richard); Piedmont, Que. (Norris). St. Hilaire, Que., 22 June, (Stevenson).

Erebia disa, Thunb., var. *mancinus*, Db.-Hw. A few specimens of this very local species were taken by Mr. N. B. Sanson at Banff, Alta., in the middle of July. Mr. Sanson obtained eggs, from which larvæ at Ottawa are now hibernating after second moult.

Chionobas jutta, Hbn. A new locality for this species has been found by Mr. A. E. Richard at Langevin, Que., 50 miles south of Quebec city, 27 July.

Thecla spinetorum, Bdv. A fine male of this rare species was taken at Fairview, B. C., (Edmund Reynolds).

Thecla irus, Gdt. Anticosti, (Schmitt).

Chrysophanus dorcas, Kirby. Rounthwaite, Man., (Marmont).

Papilio cresphontes, Cram. More abundant than for many years, London, (Moffat).

Pieris napi, Esp., var. *bryoniæ*, Ochs. Banff, Alta., 3 May, (Sanson).

Papilio nitra, Edw. High River, Alta., (T. Baird).

Pamphila pawnee, Dodge. Cartwright, (Heath). Aweme, (Criddle).

Terias lisa, Bd-Lec. Ottawa, 18 Oct. (Gibson).

Carterocephalus mandan, Edw. Halifax, (Perrin).

HETEROCERA.

Lepisesia ulalume, Strk. Mr. Harvey writes to me that the specimen credited to him in last year's record was taken by Mr. E. Wilson. Two fresh records have been received for 1902. 26 May, Vancouver, B. C., (Bush); and a second by the Hon. N. C. Rothschild, near the same place.

Deidamia inscripta, Harr. London, (J. Bice and J. Tanton).

Philampelus pandorus, Hbn. Trenton, 20 Aug., (Evans).

Ampelophaga versicolor, Harr. London, (J. Bice).

Protoparce cingulata, Fab. "St. John, 5 Oct. I had no occurrence of this fine hawkmoth in New Brunswick until now. I have just caught two specimens." (McIntosh).

Albuna pyramidalis, Walk. This species is not uncommon at Nepigon, north of Lake Superior, and may frequently be seen along the railway track. In July last the writer took five specimens flying around a raspberry bush. There were two females and three males, and the variations of colour covered all the three varieties, var. *montana*, var. *rubescens* and var. *coloradensis*, which are recognized in Beutenmuller's Monograph of the Sesiidae. The two varieties *rubescens* and *coloradensis* were also taken this year at Vancouver by Mr. Harvey, and the var. *montana* by Mr. Cockle at Kaslo.

Sesia albicornis, H. Edw. A specimen taken at Ottawa some years ago by the Rev. G. W. Taylor is this species. It has not been previously recorded for this locality.

Sarrothripa columbiana, H. Edw. Victoria, May, (Anderson and Hanham).

Arctia yarrowi, Stretch. This rare species only once previously recorded in Canada from Hudson Bay by Dr. Robert Bell, was taken on 18 Aug. last in the Rocky Mountains, on a bare summit above Lake Agnes, Laggan, Alta., (Dr. W. Barnes).

Several other species of *Arctia* which have been recorded, are now receiving special study and will be reported on later.

Phobetron pithecium, A. and S, Mt. St. Hilaire. Q. (Stevenson).

Euproctis chrysorrhœa, L. The first Canadian specimen of the Brown-tailed Moth, which has been so destructive around Boston, Mass. was taken at St. John, N. B., by Mr. McIntosh this year. No others were seen.

Datana contracta, Walk. Trenton, 10 to 24 July, (Evans).

Gluphisia severa, H. Ed. "Have had a single specimen in my collection for years." Cartwright, June, (Heath). Kalso, (Cockle).

Hepialus montanus, Stretch. Dr. Barnes reports this as common at Vancouver and Victoria.

Hepialus mustelinus, Pack. St. John, common, (McIntosh). Anticosti, (Schmitt). Ottawa, (Young, Gibson).

Bombycia improvisa, H. Ed. Victoria, 19th October, (Hanham). 26th October, (Anderson).

Bombycia semicircularis, Grt. New Westminster, (Jones). Victoria, 19th June, (Hanham).

Bombycia Tearlii, H. Ed. New Westminster, (Jones).

Feralia major, Smith. Ottawa, 20th April, (Fletcher). Toronto, (Gibson).

Momophana Comstocki, Grt. Victoria, 16th April, (Anderson). New Westminster, (Jones).

Acronycta hesperida, Smith. Kaslo, Eggs sent 4th July. (Cockle). Bred specimen 28th June, Vancouver, (Harvey).

Acronycta hæsitata, Grt. Meech Lake, Que., 2nd June, (Young).

Acronycta perdita, Grt. Victoria, (Anderson).

Acronycta Canadensis, Sm. Larva on poplar ; pupa Aug., 1901 ; imago 27th May, 1902. Kalso, (Cockle).

Chytonix sensilis, Grt. Meech Lake, Que., 7th June, (Young)

Semiophora elimata, Gn. St. John, 24th July, (McIntosh).

Semiophora Youngii, Sm. Mer Bleue, Ottawa, 18th Sept. (Young, Gibson).

Agrotis genicula, G. & R. Meech Lake, Que., 9th June, (Young).

Noctua jucunda, Walk. Meech Lake, Que., 26th July, (Young).

Noctua rubifera, Grt. Meech Lake, 25th July, (Young).

Noctua atricincta, Beulah, Man., (Dennis).

Porosagrotis mimallonis, Grt. Meech Lake, 31st July, (Young).

Carneades fumalis, Grt. Meech Lake, 3rd Sept., (Young).

Carneades velleripennis, Grt. Meech Lake, 25th Aug., (Young).

Carneades reuda, Strck. Victoria, 1st Sept., (Anderson).

Carneades pleuritica, Grt. Aweme, Man., (Criddle).

Carneades titubatis. Victoria, 1st Sept., (Anderson).

Carneades vetusta, Walk. Victoria, (Hanham).

Carneades vulpina, Sm. Kalso, 27th July, (Cockle).

Carneades Ridingsiana, Grt. Kalso, 22nd Aug., (Cockle). Beulah, (Dennis).

Mamestra circumvadis, Sm. Jl. N. Y. Ent. Soc., 1902, p. 42. Aweme, (Criddle). Cartwright, (Heath).

Mamestra obscura, Sm. Cartwright, (Heath).

Mamestra anguina, Grt. Cartwright. Several ; have previously only seen an odd one at long intervals, (Heath).

Mamestra rectilinea, Sm, Victoria, Aug., 23, (Anderson).

Scotogramma sedilis, Sm. Kaslo B. C., (Cockle). Very rare.

Scotogramma inconcinna, Sm. Kaslo, (Cockle).

Hadena nigrior, Sm. Meech Lake, 14th June, (Young).

Hadena claudens, Walk. Victoria, (Anderson).

Hadena cariosa, Grt. Meech Lake, 16th July, (Young).

Hadena plutonia, Grt. "At sugar", Cartwright, 12th July, (Heath).

Hadena algens, Sm. Meech Lake, 12th Sept., (Young).

Hadena binotata, Walk. Victoria, B. C., July, (Harvey).

Oncocnemis Barnesii, Sm. Kaslo, B. C., (Cockle). This was described from the unique type in Dr. Barnes's collection, taken in Yellowstone Park.

Oncocnemis riparia, Morr. Aweme, (Criddle).

Macronoctua onusta, Grt. Two specimens reared from larvæ feeding in and on stems of *Iris versicolor*, L., emerged 3rd Sept., Montreal, (Winn). Belleville, 1880, (Evans). Ottawa, 29th Sept., 1902, (Fletcher).

Hydrœcia inquæsita, G. & R. Two specimens, 12th and 25th Sept., Ottawa, (Young). Trenton, (Evans).

Hydrœcia cerussata, Grt. Ottawa, two specimens, 8th Sept., (Fletcher, Young).

Hydrœcia marginidens, Gn. Larva common in stems of *Cicuta*, near Montreal West, end of July, (Winn).

Several other species of *Hydrœcia* have been reported, but there is so much confusion in the genus that for the present they are held over. Those mentioned above have been identified by Mr. Henry Bird.

Arzama diffusa, Grt. Trenton, (Evans).

Arzama densa, Walk. Vancouver, (Harvey).

Tæniocampa oviduca, Grt. Meech Lake, Que., 26th May, (Young).

Tæniocampa culea, Gn. Meech Lake, Que., 31st May, (Young).

Tæniocampa subterminata, Sm. Vancouver, abundant, (T. Wilson, Bush and Harvey).

Perigrapha transparens, Grt. 3 specimens, April, Vancouver, (Harvey).

Scopelosoma devia, Grt. Ottawa, 22nd April, (Young).

Ipimorpha pleonectusa, Grt. "A leaf roller on poplar," Kaslo, (Cockle). Victoria, (Anderson).

Xylina Baileyi, Grt. Wellington, (Taylor).

Xylina gausapata, Grt. Victoria, 21st Oct., (Anderson). This is a very rare species.

Xylina Thaxteri, Grt. New Westminster, (Jones).

Xylina holocinerea, Sm. Wellington, April, (Taylor). New Westminster, (Jones).

Xylina fagina, Morr. 16th April, Ottawa, (Young). Wellington, 17th April, (Taylor). New Westminster (Jones).

Xylina ferrealis, Grt. Sept., Ottawa, (Gibson).

Plusia formosa, Grt. St. John, July 24, 2 specimens. (McIntosh).

Plusia mappa, G. & R. Hatzic, B. C., July, (R. Draper). Victoria, (Taylor). St. John, N. B., Not uncommon. (McIntosh).

Plusia metallica, Grt. =*scapularis*, H. Ed., and *lenzii*, Behr. Kalso, (Cockle). Wellington, (Taylor). Victoria, July 7, (Anderson).

Plusia rectangula, Kirby = *mortuorum*, Gn. St. John, common, (McIntosh). Montreal, 5 sp., 19th Aug., (Norris). Wellington, (Taylor). Victoria, (Anderson).

Plusia diasema, Dalm. A few specimens of this fine species have been taken at Kalso by Mr. Cockle in August.

Plusia alias, Ottol. This species has in the past been confused with *rectangula*, which it resembles, but has less silver. It has also been commonly labelled *u-aureum*, but has been recently characterized by Mr. Ottolengui as a species under the name of *alias*. St. John, common, (McIntosh).

Plusia excelsa, Ottol. Kaslo, July 31, (Cockle).

Plusia variana, Ottol. St. John, (McIntosh).

Plusia rubidus, Ottol. St. John, (McIntosh).

Melaporphyria ononis, Fab. Cartwright, (Heath). "Have not seen it for many years." A day-flyer. July, Lauder, Man., (Sandercock). Beulah, (Dennis).

Copablepharon absidum, Har. Five specimens of this striking moth were taken by Mr. Criddle at Aweme, on July 11 ; three of these have a subterminal row of very fine dark brown dashes across the primaries.

Heliothis phlogophagus, G. & R. Beulah, Man., (Dennis).

Anarta melanopa, Thunb. Mount Cheam, B. C., 14th Aug., (Bush and Fletcher).

Annaphila diva, Grt. Vancouver, June, (Bush).

Catocala hermia, H. Ed. Hatzic, Aug., (Draper).

Catocala elda, Behrens. Hatzic, B. C., (Draper).

Pseudolimacodes littera, Gn. Two specimens of this pretty little moth have been taken at Ottawa in June. (Gibson, Young).

Erebus odora, L. Vancouver; found in an electric light, (Bush). We now have records of this fine immigrant right across Canada, from ocean to ocean. It is very remarkable if the species does not breed in Canada.

Capis curvata, Grt. At light, Cartwright, (Heath).

Brephos infans, Moeschl. This interesting little moth has now been recorded from the Atlantic to the Pacific. St. John, (McIntosh). Montreal, 25th March, (Norris). Ottawa, April, (Fletcher). Toronto, April, (Gibson). Aweme, Man., (Criddle). High River, Alta., (T. Baird). Banff, Alta., (Sanson). Victoria, B. C., (Anderson). Nanaimo and Wellington, B. C., (Taylor).

COLEOPTERA:

Cicindela montana, Lee.

Cincindela formosa, Say, var, *Manitoba*, Leng.

Cincindela scutellaris, Say, var. *Lecontei*, Hald.

Cincindela venusta, Lec.

All of the above 4 species have been taken at Aweme by Mr. Criddle.

Cychrus viduus, Dej. Several specimens of this handsome beetle are recorded as captured in 1902. St. John, (McIntosh). Mount St. Hilaire, Q., June 11; two other specimens were taken at the same place three years ago, (Chagnon). Mt. St. Hilaire, Q. July 1. (Stevenson).

Blethisa Julii, Lec. Specimens were taken at Quebec some years ago, (Hanham).

Blethisa quadricollis, Hald. Hull, Q., and Buckingham, Q., (Harrington).

Blethisa multipunctata, L. Two specimens under dead leaves, Montreal, Sept., (Chagnon).

Blethisa Oregonensis, Lec. Victoria, (Taylor).

Calathus advena, Lec. St. John, (McIntosh).

Galerita janus, Fab., Rigaud, May 25, (Stevenson).

Platynus anchomenoides, Rand. St. John, (McIntosh).

Platynus excavatus, Dej. St. John, (McIntosh).

Platynus 4-punctatus, Dej. St. John, (McIntosh).

Platynus nigriceps, Lec. Rare; Toronto, May 15, (Crew). Nepigon, (Fletcher).

Callida punctata, Lec. Montreal, July 11, on flowers, (Chagnon).

Brachylobus lithophilus, Say. Toronto, rare, May 15, (Crew).

Harpalus pleuriticus, Lec. St. John, (McIntosh.)

Harpalus laticeps, Lec. St. John, (McIntosh).

Sphæridium scarabæoides, L. Toronto, (Crew). This interesting beetle first appeared at Toronto about three years ago, and is evidently spreading through Canada.

Cercyon indistinctum, Horn. Trenton, (Evans).

Pselaphus Erichsonii, Lec. Toronto, (Crew). Ottawa, (Harrington).

Gymnusa brevicollis, Grav. Toronto, rare, (Crew).

Quedius vernix, Lec. Wilcox Lake, north of Toronto, under a stump, March 28; two specimens, (Crew).

Tachyporus jocosus, Say. St. John, May 1, (McIntosh).

Coccinella monticola, Muls St. John, (McIntosh).

Aphorista læta, Lec. Vernon, (Venables). Kaslo, (Cockle).

Hister semiruber, Casey. Aweme, Man. (Criddle.) Blackfalds, Alta. (Gregson).

Hister coarctatus, Lec. Trenton, (Evans).

Ips obtusus, Say. In running sap on an oak tree, Toronto, Sept. 7th, very rare. (Crew).

Prionocyphon discoideus, Say. June 28, St. John, (McIntosh).

Cyphon concinnus, Lec. Vernon, (Venables).

Calochromus dimidiata, Lec. Osoyoos, (C. de B. Green).

Corymbites medianus, Germ. "Trout Creek," Toronto, June 5, (Crew).

Corymbites hamatus, Say. "Trout Creek," Toronto, June 5, rare, (Crew).

Chrysophana placida, Lec. Vernon, (Venables).

Malachius æneus, L. St. John's, Que. June 9, (Chagnon).

Xestobium elegans, Horn. Anticosti, (Schmitt).

Cupes capitata, Fab. Toronto, August 15, rare, (Crew).

Hylecœtus lugubris, Say. A pair of this rare and interesting Lymexilid was taken this season on an old maple stump at Rigaud, Que., by Rev. Father Desrochers. He had also previously taken two females at the same place. The female differs from the male in having the head and thorax reddish orange.

Canthon simplex, Lec. Macleod, Alta., June 20, (Fletcher).

Xyloryctes satyrus, Fab. Two specimens of this fine scarab were taken at Trenton, 6 June (Evans). Ottawa, (Fletcher, Harrington).

Tylonotus bimaculatus, Hald. Trenton, 27 August, at light, had only two specimens before, (Evans).

Obrium rubrum, Newm. Trenton, (Evans). This rare little longicorn is occasionally found at Ottawa on hickories.

Neoclytus caprœa, Say. St. John, (McIntosh).

Desmocerus cribripennis, Horn. Vancouver, May, (Harvey). Vernon, (Venables).

Toxotus obtusus, Lec. Vernon, (Venables).

Anthophylax mirificus, Bland. One male, Kaslo, (Cockle).

Acmaeops bivittata, Say. Calgary, (Fletcher).

Acmaeops atra, Lec. Vernon, (Venables).

Acmaeops subpilosa, Lec. Vernon, (Venables).

Acmaeops longicornis, Kirby, Vernon, (Venables).

Gaurotes Cressoni, Bland. Vernon, (Venables).

Bellamira scalaris, Say. Ottawa, (Fletcher).

Leptura sanguinea, Lec. St. John, (McIntosh).

Leptura lineola, Say. Beaten from dogwood blossoms, "Trout Creek," Toronto, June 9, (Crew).

Leptura vagans, Oliv. With the above, (Crew).

Leptura vexatrix, Mann. Blackfalds, Alta. June 3, (Gregson).

Leptura tibialis, Lec. Anticosti, (Schmitt).

Encyclops cæruleus, Say. "Trout Creek," Toronto, (Crew).

Goes debilis, Lec. "Trout Creek," Toronto, June 9, (Crew).

Goes oculata, Lec. with the above, rare, (Crew).

Eupogonius vestitus, Say. Also with the above, rare, (Crew).

Chrysochus cobaltinus, Lec. Vernon, (Venables).

Monoxia puncticollis, Say.

Many specimens, very variable. Halifax, N.S., (Evans).

Microrhopala excavata, Oliv. Say. St. John, July 24, (McIntosh).

Cassida viridis, L. This European tortoise beetle has evidently established itself in Canada. Dr. Fyles has referred to it in the Canadian Entomologist XXXIV., p. 273, and his note has been commented upon by Rev. Elias Roy, in Le Naturaliste Canadien, 1902, p. 145, as *C. thoracica*, Illig. Dr. Fyles has recently referred his specimens to the British Museum and has received the following report from Mr. C. O. Waterhouse: "I have carefully examined the Cassida you send, and I am sure it is our common thistle species *C. viridis*." Mr. Winn reports that it was common in all stages at Levis, Que., on Aug. 21, feeding upon dock and thistle.

Mordella servel, Say. St. John, July 24, (McIntosh).

Mordella borealis, Lec. St. John, (McIntosh). Both this and *M. servel* are rare species.

Corphyra inconspicua, Horn. A specimen of this Californian species was taken at Vernon by Mr. Venables.

Calopus aspersus, Lec. Vernon, (Venables).

Rhinomacer pilosus, Lec. St. John, June 9, McIntosh).

Myodites scaber, Lec. Vernon, (Venables).

Myodites zeschii, Lec. St. John, (McIntosh). Abundant in the beginning of July on the buds of Solidago at Nepigon, (Fletcher).

Peritelopsis globiventris, Lec. Vernon, (Venables).

Geoderces melanothrix, Kirby. St. John, June 23, (McIntosh).

Phytonomus punctatus, Fab. Victoria, July, (Hanham). This Clover Weevil has apparently spread to the Pacific province and is there in considerable numbers. Mr. Hanham writes that during the last week in July he took 100 specimens on his tennis lawn from pieces of board put there for the purpose of trapping insects, and he could collect specimens at any time during the season by the same method. He saw no sign of the fungous disease which usually controls this insect in the east.

Gryphidius equiseti, Fab. St. John, July 8, (McIntosh).

Lixellus filiformis, Lec. and *Lixus rubellus*, Rand. Appear to be quite common on plants growingat the edge of a lake in Mount St. Hilaire, Que. The former is often found on weeds emerging only a few inches from the water, and growing sometimes forty or fifty feet from the shore. Some of the specimens are covered with a hard coat of mud. *L. rubellus*, Rand., is found on plants growing close to the water's edge, (Chagnon).

ORTHOPTERA.

Mr. E. M. Walker, of Toronto, has continued his studies of the Canadian locusts and their allies, and has published some of his results in the *Canadian Entomologist*, but has been prevented this year by other work from preparing a report upon recent captures. He however sends the following notes on species of special interest:

Melanoplus Bruneri, Scudd., a single male was taken at Dwight, Northern Muskoka, 2nd September. This is of special interest, as it is a western species known only previously from Alberta and some of the western states. (Walker.)

Xiphidium saltans, Scudd., another western insect, which was taken in considerable numbers in a certain part of High Park, Toronto, during August and September. They occurred in bunches of rather long grass on sandy soil, and were in company with *Melanoplus Dawsoni*, Scudd., among other Orthoptera. Both *X. saltans* and *M. Dawsoni* are species belonging to the western prairies and their occurrence together so far east is of some interest. (Walker.)

ODONATA.

A few workers have collected Dragon-flies during 1902 and more extensive work is planned for next season. Several observers have reported the extraordinary numbers of these insects seen on the prairies during the past season. Mr. Harvey, of Vancouver, Mr. E. M. Walker, of Toronto, and Mr. T. J. McLaughlin, of Ottawa, have sent in short lists of species. These *will be reported* upon in the next Entomological Record.

HYMENOPTERA.

By W. Hague Harrington, Ottawa.

Collectors are being gradually attracted to this important order, and several nice lots have been sent in for determination. Among those who are now collecting may be mentioned Mr. R.V. Harvey, Vancouver, B.C.; Mr. E. P. Venables, Vernon, B.C.; Mr. A. G. Leavitt, St. John, N.B.; Mr. J. B. A. Leo Leymarie, Montreal, and Dr. Schmitt, Anticosti Island, Que. This number will undoubtedly increase as our members realize how much of interest from the scientific standpoint, and how much of importance from an economic aspect the species of this order possess. The enormous number of species, even in our northern regions, ensures the continual discovery of rare and new forms, thus giving a frequent stimulus to the collector and student of them. Indeed, the trouble at present is not so much to obtain new material as to determine and utilize what is received. This difficulty will gradually disappear as specimens become named and arranged in a greater number of accessible collections, and as classifications are placed upon a more durable basis and synopses and descriptive monographs are multiplied.

No works dealing specially with Canadian Hymenoptera have, I think, appeared during the year, but the several entomological magazines have contained various articles in which species from Canada are described or mentioned. Ashmead has continued in the *Canadian Entomologist* his valuable papers on the "Classification of the Fossorial, Predaceous and Parasitic Wasps, or the Super-family Vespoidea," and in the November number of the *Canadian Entomologist* the family Trigonalidæ is reached and tabulated. An annotated list of the Ottawa species of the Super-family Sphegoidea was published in the *Ottawa Naturalist*, vol. xv. p. 215, January 1902 (Harrington). Though not treating of Canadian specimens, the "Papers from the Harriman Alaska Expedition" are of extreme interest and value, as a large proportion of the insects catalogued and described are certain to be distributed through our adjacent territories, some indeed being transcontinental in their distribution. The entomologist to the expedition was Prof. Trevor Kincaid, and the extent of his collections testify to his ability and assiduity. He has discussed the Tenthredinoidea in paper No. vii., enumerating over fifty species, of which more than one-half are new. He has also, in paper No. xiv., dealt with the Sphegoidea and Vespoidea, of which only nine species occurred, two of which are new. The Formicoidea yielded only six species which were considered by Pergande. All the rest of the Hymenoptera were placed in Ashmead's hands and proved very rich in new species. His report, paper No. xxviii., contains not only the descriptions of these but is a complete catalogue of all species now known from Alaska. These number in all 335 species of which he describes 201 as new. This will give some idea of the yet unknown riches of our own northern fauna. An interesting paper has been received from Dr. Kiaer of Tromso Museum, Norway- "Die arktishen Tenthrediniden"—a catalogue of the Arctic sawflies of Europe, Asia and America, which enumerates a number of Canadian species.

The material amassed during the past season by our various collectors is as yet largely undetermined; even the Ottawa species showing a very large proportion unnamed. The following list, therefore, does not pretend to give in any measure a complete record, but mentions only a few of the species which appear of more than ordinary interest:

Bombus frigidus, Smith. This is an Arctic species recorded from Great Slave Lake and the Yukon River. Females and workers received from Anticosti Island (Schmitt).

Bombus juxtus, Cress. From Goldstream, B.C. (Harvey).

Bombus mixtuosus, Ashm. One of the new species described from Alaska. Specimens from Vancouver (Harvey), Rocky Mountains, Laggan ? (Bean) and Banff, Alta., (Fletcher). A worker minor from Nepigon (Fletcher) may also possibly belong to this species.

Bombomelecta thoracica, Cress. Vernon, B.C. (Venables).

Perdita 8-maculata, Say. A pretty little species from St. John, N.B., (Leavitt).

Spilomena pusilla, Say. This little species, the smallest of our Sphegoidea, was omitted from the recently published list of Ottawa species. The single example taken had been placed with some unexamined proctotrypids, some forms of which it superficially resembles. Ottawa (Harrington).

Thyreopus latipes, Smith. Not known to me before from the Pacific coast. Two males from Victoria (Harvey), and one from St. John, N.B. (Leavitt.)

Odynerus arvensis, Sauss. Male from Trenton, Ont. (Evans).

Polybia flavitarsis, Sauss. This seems to be a common species in Vancouver Island. Specimens received from Victoria (Taylor and Harvey).

Ibalia maculipennis, Hald. This interesting cynipid has been taken at Montreal (Chagnon).

Ichneumon viola, Cress. A fine distinct species from Goldstream, B.C. (Harvey).

Thalessa Nortoni, Cress. This large ichneumon-fly seems to be widely distributed but rare, and has hitherto been vainly sought at Ottawa. From Levis, Que. (Fyles), Victoria, B.C. (Harvey), Mount Ché-am, Fraser River, B.C. (Fletcher).

Dyseidopus Vancouverensis, Bradley. A new species described in *Entomological News*, vol. xiii., p. 307, December, 1902, from Vancouver, B.C. (Harvey).

Odontomerus bicolor, Cress. Victoria, B.C. (Harvey).

Metopius pollinctorius, Say. A large and striking tryphonid, Ottawa (Harrington).

Tremex columba, Linn. A common eastern species, Vernon, B.C. (Venables).

Calamenta (Cephus) trimaculatus, Say. Seems to be a rare species. Trenton (Evans).

Lyda atrata, Cress. One male only has been taken near Ottawa (Evans).

Bactrocerus excavatus, Nort. Also a rare form from Trenton (Evans).

Schizoceros plumiger, Klug. Taken for first time in Canada at Deloraine, Man. (Fletcher)

Hylotoma rubiginosa, Beauv. Also an addition to our saw-flies. Nepigon, Ont. (Fletcher).

Blenocampa inhabilis, Nort. St. John's, Que. (Chagnon), Halifax, N.S. (Evans).

Anoplonyx Canadensis, Hrgtn. A new species described from Ottawa (Harrington).

Trichiocampa gregarius, Dyar. St. John's, Que. (Chagnon), Ottawa (Harrington).

Pteronus magus, Marlatt. This species was described from Canada, but no locality was given. A fine female was taken at Trenton, Ont. (Evans).

Taxonus nigrisoma, Nort. This common species has been found to have the habit of boring into apples before pupating (Fletcher).

Pachyprotasis nigrofasciata, Esch. Taken by Kincaid in Alaska and found by him to be identical with *Macrophya omega*, Nort. A species with a wide distribution in the United States and Canada. Its records include the Pacific coast, Saskatchewan and Labrador. Now received from Anticosti Island, Que. (Schmitt).

Macrophya fuliginea, Nort. This species seems rare and local. Montreal (Ouellet).

Macrophya albilabris, Hrgtn. Male from Montreal (Ouellet). Female not known.

Macrophya Oregona, Cress. First occurrence in Canada. Vancouver, B.C. (Harvey).

Homœoneura 14-punctata, Nort. Occurs rarely at Ottawa (Harrington). Montreal, Ouellet).

Tenthredo nigrisoma, Hrgtn. Inhabits British Columbia and Alaska. Vancouver (Harvey).

Tenthredo eximia, Nort. At Ottawa, a rare species. Montreal (Ouellet).

DIPTERA.

BY W. HAGUE HARRINGTON, OTTAWA.

Scant attention is given to the members of this order by our collectors, and no papers have been published recently regarding our flies except that of Mr. Chagnon upon the Syrphidae of the Province of Quebec which first appeared in the Naturaliste Canadien for 1901, but is now issued as a pamphlet of 75 pages in which he describes 33 genera and 71 species. Mr. Chagnon seems to be the only Canadian collector specially studying diptera. A few are taken occasionally by other members, but in most collections these insects are probably unnamed. Lists have been received from Mr. Harvey, of Vancouver, and Mr. McIntosh, of St. John, N. B. These will be reported at a latter date. Dr. Schmitt, of Anticosti Island, has forwarded some from that unworked locality, but many of the species have yet to be determined. Since the discovery of the carrying of fever germs by mosquitoes, special attention has been directed to these forms in America and elsewhere, and many new species have been described, and much has been learned of the larval habits of different species which was formerly unknown. The wave of investigation has however been but slightly felt in Canada.

The following eleven species of diptera have been added to our fauna at intervals ;

Sciophila subcœrulea, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxiii, p. 595—Canada, New Hampshire and Pennsylvania. Ottawa (Harrington).

Dryomyza aristalis, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxiii, p. 617—Ottawa, Can. (Harrington).

Culex Fletcheri, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxv, p. 84—Alberta and Assiniboia (Fletcher).

Simulium fulvum, Coq. n. sp. Proc. U.S. Nat. Mus., Vol. xxv, p. 96—Montana, Colorado, Alaska and British Columbia. Calgary, Medicine Hat, N. W. T. and Mt. Cheam, B. C. (Fletcher). Laggan, B. C. (Wickham).

Oestrophasia calva, Coq. n. sp. Proc. U.S. Nat. Mus., Vol. xxv, p. 109—Arizona, Canada. Ottawa (Harrington).

Exoristoides Harringtoni, Coq. n. sp. Proc. U.S. Nat. Mus. Vol, xxv, p. 110—Ottawa (Harrington).

Mydæa flavicornis, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxv, p. 123. Missouri, Canada. Rouville, Q. (Chagnon).

Tephronota Canadensis, Johnson, n. sp. Ent. News. Vol. xiii, p. 144—Rigaud, Que. (Chagnon).

Psilocephala grandis, Johnson, n. sp. Can. Ent. Vol. xxxiv, p. 241—Rouville, Que. (Chagnon).

Pyrgota Chagnoni, Johnson, n. sp. Can. Ent. Vol. xxxii, p. 246—Montreal. (Chagnon).

Tipula decora, Doane, n. sp. Journ. N.Y. Ent. Soc. Vol. ix, p. 125—Montreal (Chagnon).

Mr. Chagnon writes : My most important capture among the Syrphidæ is a specimen of *Merodon equestris*, Fab. This is new to North America and is an interesting addition to our fauna. Mr. McIntosh has also added many new species to the Canadian list, all of which have passed through Mr. Coquillett's hands.

A KEY TO ORCHARD INSECTS.

BY W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Signs are not wanting that our fruit growers desire more definite information about the insects commonly met with in the orchards. They want to *know* the insects which they are constantly fighting. They want to *spray intelligently* and with a definite purpose in view, and not by a blind *rule-of-thumb*, as set forth in some spray calendar.

The day is fast approaching when the successful fruit-grower will not dare to neglect the study of insects. He must know, or recognize, the authors of the injuries done to his trees and shrubs, if he ever hopes to get the largest returns for his investment.

In the following *Key to Orchard Insects* an attempt is made to group the insects according to (1) the host-plant attacked; (2) the particular part or parts of the host-plant attacked; (3) the character of the injuries; and (4) in some instances, the most peculiar characteristic habits. Insects are known by their work. Every insect has its own peculiar mode of working, and when the injurious insect is once recognized and its habits known, it is usually not difficult to follow a line of treatment which will be successful.

Remedies are not given here. They may be found in the Spray Calendar, (Bulletin 122), published by the Department of Agriculture, Toronto.

From the stand-point of the fruit-grower, the *mouth-parts* of insects are the most important portions of their anatomy. Consequently, a special study should be made of these parts. The young and adults of beetles, grasshoppers, and crickets have *biting* mouth-parts, hence they can usually be readily killed by the application of Paris Green, or some other poisonous substance to their food. The adults of butterflies and moths have *sucking* mouth-parts, hence cannot be killed by poisons. These, however, are not usually injurious. The young forms of these, known as caterpillars, have *biting* mouth-parts, hence they can be poisoned. Both the young and adult forms of bugs and plant lice have *sucking* mouth-parts, hence they must be treated with powders, liquids or gases that kill by contact or suffocation.

It is also of importance that the fruit-grower learn to recognize the larvæ, for they are usually the most injurious stage of insect life. The young of moths and butterflies, usually called *caterpillars*, are in most cases 16-legged, with the exception of the *loopers* which are 10-legged. The *grubs* or *worms* of saw-flies are 20-legged. The young of beetles, or grubs, are usually 6-legged. The maggots of flies, bees and wasps are usually *legless*. The young of grasshoppers, bugs and plant-lice are 6-legged, and resemble more or less the adult forms.

In the preparation of this *Key*, the writer received valuable aid and suggestions from the writings of Dr. A. D. Hopkins, of West Virginia; Prof. L. Bruner, of Nebraska; Dr. W. Saunders, of Ottawa; and Dr. Bethune, of London.

Key to Apple Insects.

A. *Attacking the Roots*:

1. Causing knots or swellings on the smaller roots—bluish-white mouldy lice.
   Woolly Aphis (Schizoneura lanigera), Fig. 64.

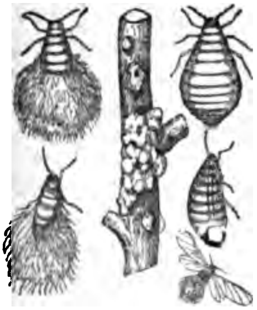

Fig. 64. Woolly Aphis.

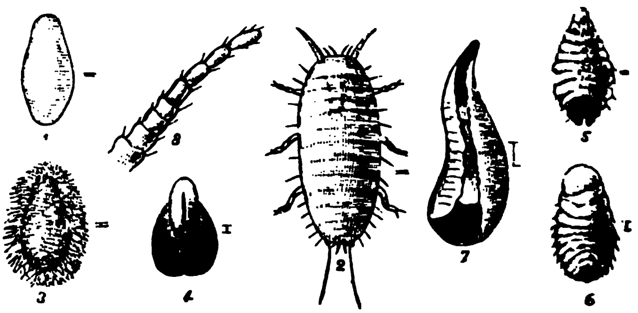

Fig. 65. Oyster-shell Bark-louse.

B. *Attacking the Trunk, Branches, and Twigs*:

1. Producing longitudinal slits in the bark; eggs under the edges of the slits.
   Buffalo Tree-hopper (Ceresa bubalus). See Fig. 7.

a. ***Fixed to Bark*:**

1. **Producing an ashy-gray incrustation on the bark; scales round, and gray and black.**

    ***San José scale* (Aspidiotus perniciosus). See Figs. 4 and 5.**

2. **Bark rough with mussel-shaped scales.**

    ***Oyster-shell Bark-Louse* (Mytilaspis pomorum). Fig. 65.**

3. **Bark scurfy with white scales.**

    ***Scurfy Bark Louse* (Chionaspis furfurus). Fig. 66.**

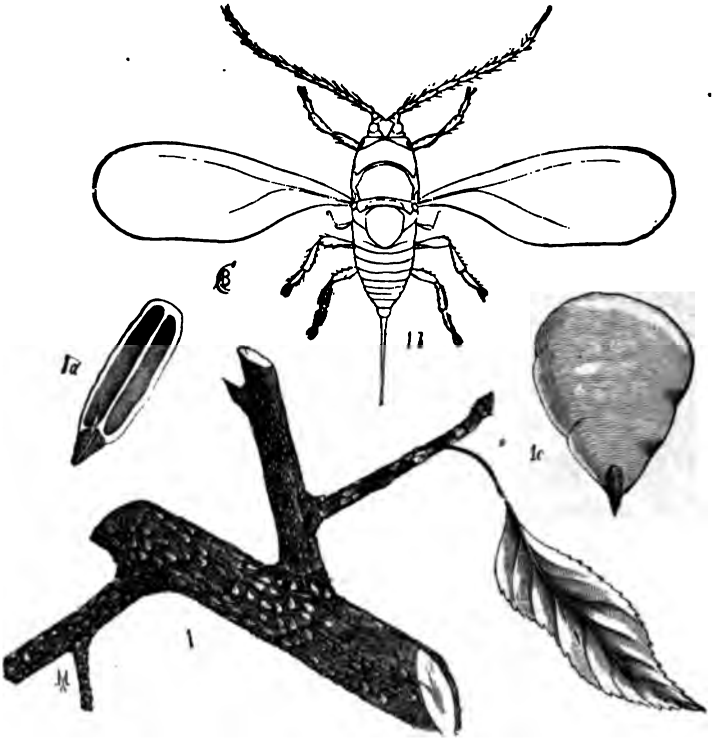

Fig. 66. The Scurfy Bark-louse.

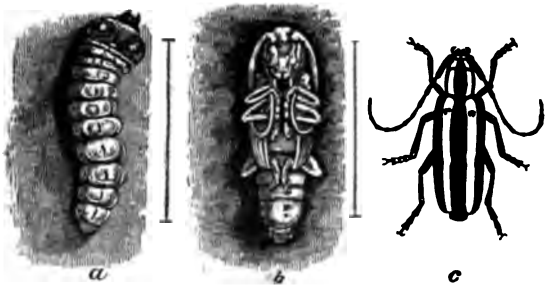

Fig. 67. Saperda Candida: (a) borer; (b) pupa; (c) beetle.

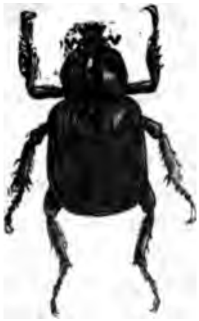

Fig. 68. Osmoderma scabra.

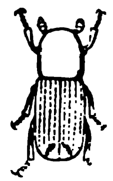

Fig. 69. Scolytus beetle.

b. ***Making Tunnels in the Wood*:**

1. **Large square-headed legless borer, at or near the ground in tunnels, with saw-dust-like excrement.**

    ***Round-Headed Borer* (Saperda candida). Fig. 67.**

2. Large flat-headed, legless borer, in upper trunk in tunnels, with saw-dust-like excrement

Flat-Headed Borer (Chrysobothris femorata).

3. Large larva in decaying wood.

Eyed Elater (Alaus oculatus) and *Rough Osmoderma* (Osmoderma scabra). **Fig. 68.**

c. Making tunnels between the Bark and Wood:

1. *Fruit Bark Beetle* (Scolytus rugulosus). **Figs. 69 and 70.**

d. White woolly patches on the twigs which are usually scarred:

Woolly Aphis (Schizoneura lanigera).

e. Green soft-bodied insects in clusters on young growths, and particularly at ends of twigs, producing distortions:

Apple Aphis (Aphis mali). Fig. 71.

f. Snout Beetles gnawing off the bark in patches:

Imbricated Snout Beetle (Epicærus imbricatus). Fig. 72.

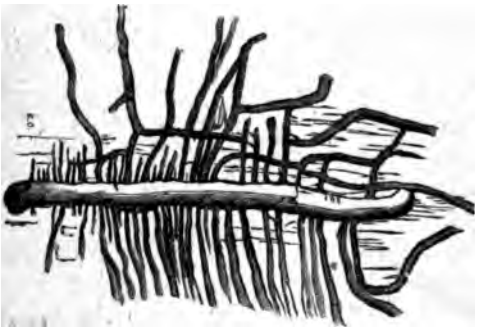

Fig. 70. Tunnels under bark made by Scolytus beetle.

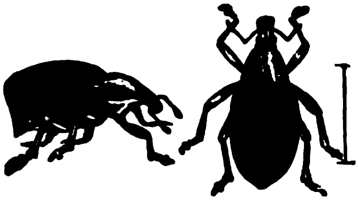

Fig. 72. Imbricated Snout-beetle.

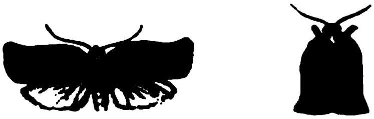

Fig. 73. Cacœcia rosaceana moth; wings open and closed.

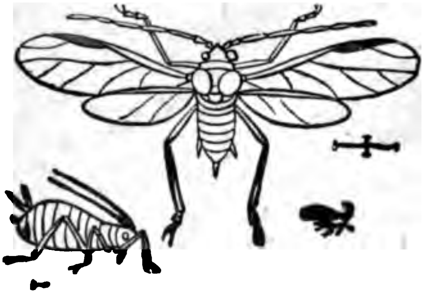

Fig. 71. Apple Aphis.

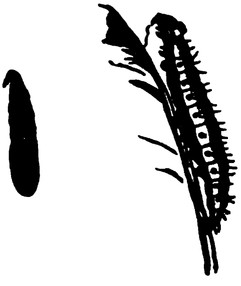

Fig. 74. Cacœcia rosaceana chrysalis and caterpillar, magnified.

C. *Attacking the Buds:*

a. Folding together the opening leaves and feeding within.

Oblique Banded Leaf-Roller (Cacœcia rosaceana), Figs, 73 and 74, and *Leaf-Crumpler* (Phycis indiginella). Fig. 75.

b. Eating the centre of the bud, or tunnelling it.

Eye Spotted Bud-Moth (Tmetocera ocellana).

c. Measuring Worms—eating leaves of buds.

Canker-Worms (Anisopteryx pometaria).

d. Caterpillars feeding within pistol-shaped cases, and eating irregular holes in the bud leaves. *Pistol-Case Bearer* (Coleophora malivorella). Fig. 76.

e. Caterpillars feeding within cigar-shaped cases, and eating small round holes in the bud leaves. *Cigar-Case Bearer* (Coleophora Fletcherella).

D. *Attacking the Leaves* :

- *a*. Gregarious caterpillars.
  1. Caterpillars protected by webs—
     - *a*. Webs in forks of branches in spring.
       Tent Caterpillar (Clisiocampa Americana). Fig. 77.
     - *b*. Webs covering the leaves in summer and early autumn.
       Fall Web-Worm (Hyphantria cunea).
     - *c*. Leaves partly eaten and drawn together by a web.
       Palmer Worm (Ypsolophus pomotellus).
  2. Caterpillars not protected by a web :
     - *a*. Clustered on limbs.
       Yellow-necked Caterpillar (Datana ministra).
     - *b*. *Red-Humped Apple-Tree Caterpillar* (Oedemasia concinna). Fig. 78.

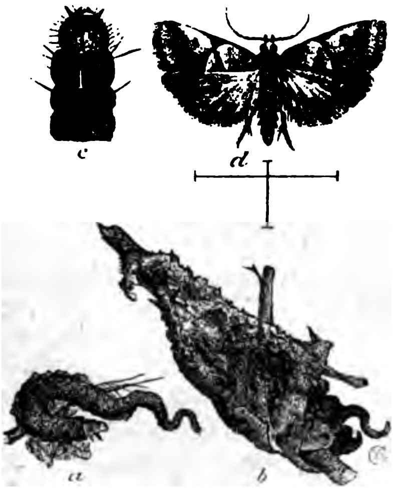

Fig. 75. Leaf crumpler : (*a*) and (*b*) winter cases ; (*c*) head of caterpillar ; (*d*) moth.

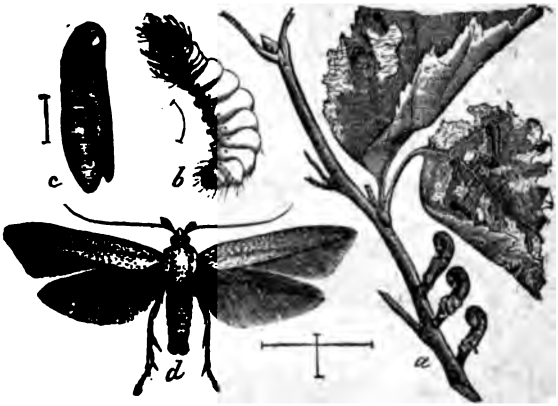

Fig. 76. Pistol-case Bearer : (*a*) pistol-cases ; (*b*) caterpillar ; (*c*) pupa ; (*d*) moth.

  3. Green soft-bodied insects, with sucking mouths.
     Plant Lice (Aphis spp). Fig. 79.
- *b*. *Solitary Caterpillars* :
  1. Protected caterpillars—
     - *a*. Mining within the leaf, pupa inside of folded leaf.
       Apple-leaf Miner (Tischeria malifoliella).
     - *b*. Mining within the leaf, mature larva and pupa within small oval seed-like bodies.
       Resplendent Shield Bearer (Aspidisca splendoriferella). Fig. 80.
     - *c*. Feeding within pistol-shaped cases which stand out from the leaf.
       Pistol-Case Bearer (Coleophora malivorella).
     - *d*. Feeding within cigar-shaped cases, which stand out from the leaf.
       Cigar-Case Bearer (Coleophora Fletcherella).
     - *e*. Feeding within folded leaves.
       Leaf-Roller (Teras malivorana) and (Cacœcia rosaceana).
     - *f*. Feeding within tubes of silk, open at both ends, on epidermis and inner tissues leaving the veinlets.
       Bud-Moth (Tmetocera ocellana).

g. Feeding on tissues of leaves beneath a silk web.

Apple-leaf Skeletonizer (Pempelia Hammondi). Fig. 81.

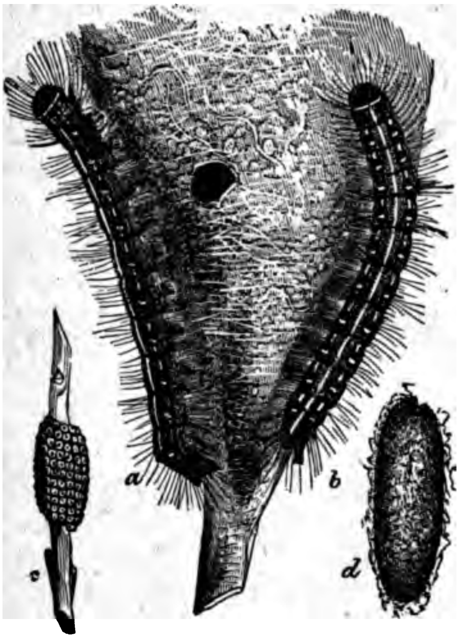

Fig. 77. Caterpillar (*a*) and (*b*) on their web ; (*c*) egg-cluster (*d*) cocoon.

Fig. 78. Red-humped Apple-tree Caterpillar.

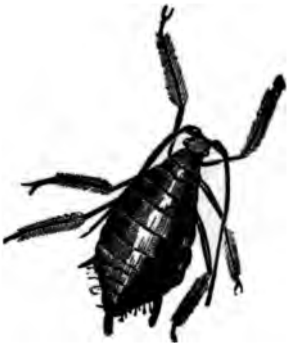

Fig. 79. Aphis, wingless female, immensely magnified.

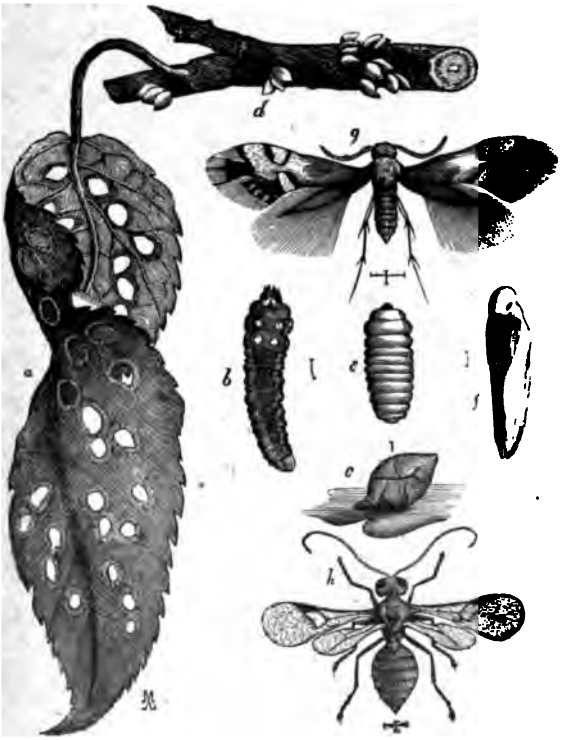

Fig. 80. Aspidisca splendoriferella : (*a*) leaf showing mines ; (*b*) *caterpillar* ; (*c*) and (*d*) pupal cases ; (*e*) larva about to change ; (*f*) *chrysalis* ; (*g*) moth ; (*h*) parasite—all except leaf and twig highly *magnified.*

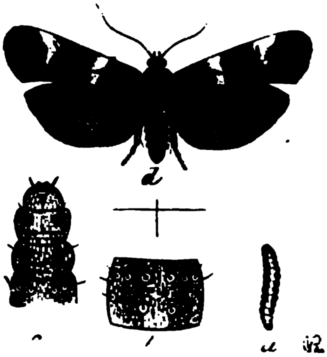

Fig. 81. Pempelia Hammondi : (*a*) caterpillar ; (*b*) a segment (*c*) head, and following segments highly magnified : (*d*) moth.

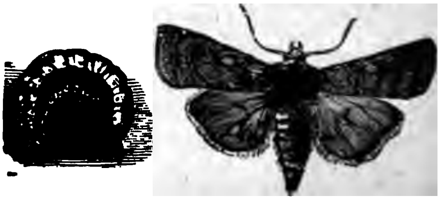

Fig. 82. Cut-worm and Moth.

2. *Unprotected Caterpillars* :

a. **Measuring worms, in spring feeding in the day-time.**

Canker Worms **(Anisopteryx pometaria and A. vernata). Fig. 83.**

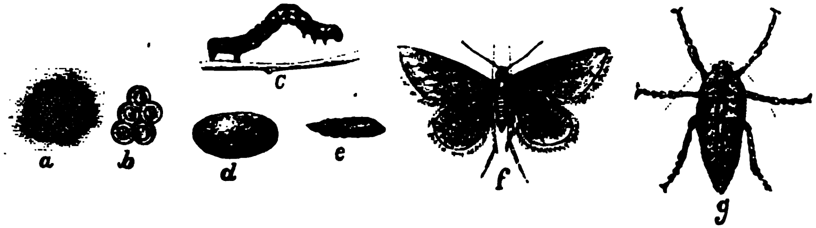

Fig. 83. Spring Canker-worm (A. vernata) : (*a*) and (*b*) eggs ; (*c*) caterpillar ; (*d*) cocoon ; (*e*) [illegible] ; [illegible] male moth (*g*) wingless female moth.

b. **Sleek 16-legged caterpillars, feeding at night.**

Cutworms. **Fig. 82.**

c. **Large, green caterpillar, covered with spiny tubercles.**

Cecropia Moth **(Samia cecropia). Fig. 84.**

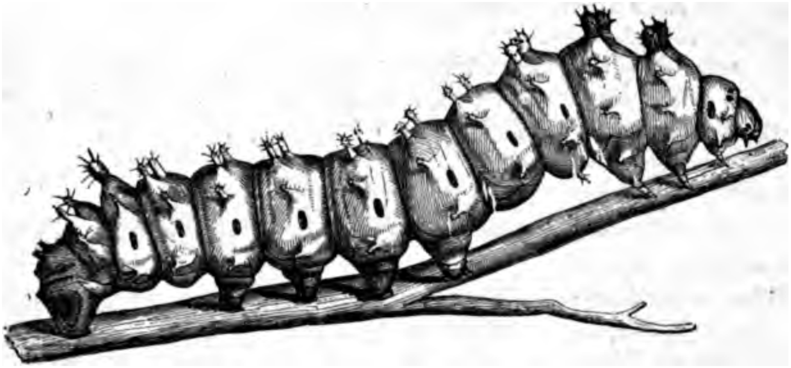

Fig. 84. Cecropia caterpillar.

d. **Large apple-green caterpillar, with white oblique stripes on sides.**

Polyphemus Moth **(Telea polyphemus).**

e. **Hairy caterpillar with long black tufts over head and tail.**

Tussock Moth **(Orgyia leucostigma).**

f. **Large green caterpillar with a reddish-brown horn at tail, and seven oblique stripes on each side.**

Apple Sphinx **(Sphinx gordius). Fig. 85.**

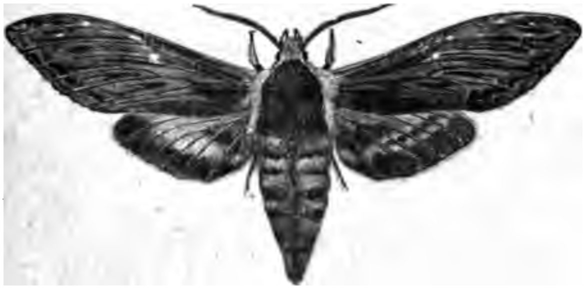

Fig. 85. Sphinx gordius.

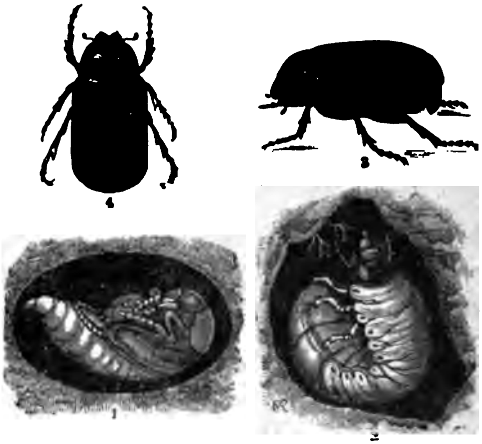

Fig. 87. May beetles : *1* pupa ; *2* grub ; *3* & *4* beetles.

g. **Small caterpillar, with brown head and yellowish-green body, feeding on leaves.**

Apple-Tree Bucculatrix **(Bucculatrix pomifoliella).**

3. *Beetles* :
   a. Large brown beetle feeding at night on leaves.
      May-beetle (Lachnosterna fusca). Fig. 87.
   b. Small brown beetles, feeding at night.
      Leaf-beetles.

E. *Attacking the Fruit* :
   a. Boring tunnels through the fruit—
      1. Tunnels mostly about the core,—brown excrement often visible at opening at blossom end of apple :
         Codling Moth. (Carpocapsa pomonella).
      2. Tunnels irregular and numerous,—
         Apple Maggot. (Trypeta pomonella).
   b. Puncturing the Fruit :
      1. Puncturing the fruit and distorting it, a 4-humped beetle,—
         Apple Curculio. (Anthonomus quadrigibbus).
      2. Purplish spots about the circular scales,—
         San José scale. (Aspidiotus perniciosus).
   c. Eating holes in the Fruit :
      1. Large light-yellow or apple-green caterpillars with a narrow cream-colored stripe along middle of the back,—
         Green-fruit Worms. (Xylina sp.,).
      2. Beetle, yellowish, hairy, ½ inch long,—
         Bumble-flower-beetle. (Euphoria inda), Fig. 88.

Fig. 88. Bumble-flour beetle.

WINTER CONDITIONS OF SOME OF THE APPLE INSECTS.

A. *Attached to trunk, branches, and twigs* :
   1. White cocoons ½ to ⅔ inch long, under loose bark, or burlap, during fall and winter,—
      Codling Moth. (Carpocapsa pomonella).
   2. Bracelets of varnished eggs around twigs in fall and winter,—
      Tent Caterpillar. (Clisiocampa Americana). Fig. 77 (*c*).
   3. Clusters of cylindrical eggs on branches and twigs in winter,—
      Fall Cankerworm. (Anisopteryx pometaria).
   4. Clusters of round, ribbed eggs,—
      Cutworms.
   5. Small, oval, shining, black eggs, usually clustered in axils of buds, in crevices, or under bark of upper branches and twigs, in winter,—
      Apple Aphis. (Aphis mali).
   6. Minute pistol-shaped cases on bark in winter,—
      Pistol-Case-Bearer. (Coleophora malivorella).
   7. Minute cigar-shaped cases on bark in winter,—
      Cigar-Case-Bearer. (Coleophora Fletcherella).
   8. Clusters of glistening oval cases on twigs in winter,—
      Resplendent-Case-Bearer. (Aspidisca splendoriferella).
   9. Minute silken cocoons at axils of buds, and in crevices of bark,—
      Bud Moth. (Tmetocera ocellana).
   10. Black, crumpled leaves folded together and fastened to the branches during winter—**half-grown** caterpillars in tortuous tubes within,—
      Leaf Crumpler. (Phycis indiginella), **Fig. 89.**

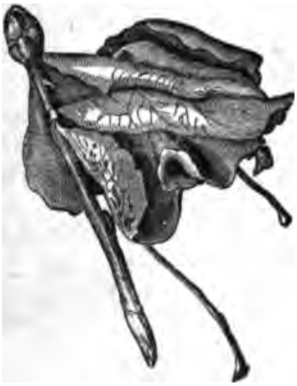
Fig. 89. Leaf-crumpler : Winter cases covered with withered leaves.

11. Large silken cocoons, 3 inches long firmly attached to twigs during winter,—
    Cecropia Moth. (Samia cecropia), Fig. 90.

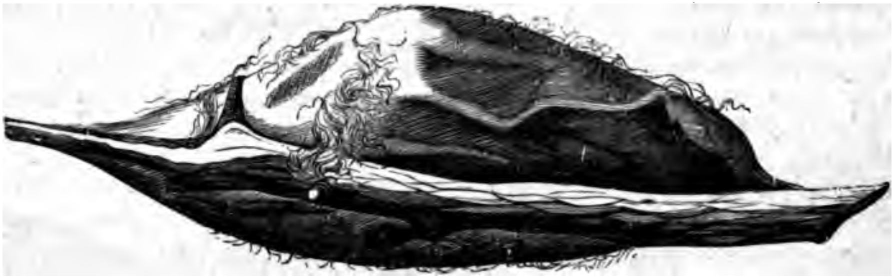

Fig. 90. Cocoon of the Cecropia moth.

12. Elongated white, ribbed cocoons, ⅓ inch long, on twigs during winter,—
    Apple Leaf Bucculatrix. (B. pomifoliella).
13. Mussel-shaped scales with whitish eggs underneath in winter,—
    Oyster Shell Bark-Louse. (Mytilaspis pomorum).
14. Whitish scales with purple eggs underneath in winter,—
    Scurfy Bark-Louse. (Chionaspis furfurus).
15. Minute black circular scales with a depressed ring about a central nipple,—
    San José scale. (Aspidiotus perniciosus).
16. A mass of eggs on a cocoon fastened to a dead leaf or a twig in winter,—
    Tussock Moth. (Orgyia leucostigma).
17. Eggs in oval slits,—
    Buffalo Tree-Hopper. (Ceresa bubalus).

A KEY TO PLUM INSECTS.

A. *Attacking the Roots* :

1. Burrowing about the crown of the roots, occasionally in young trees,—
    Peach-tree Borer. (Sannina exitiosa).

B. *Attacking the Trunk, Branches, and Twigs* :

1. Making tunnels in the wood ; saw-dust-like excrement at the mouth of tunnels,—
    Flat-headed Borer. (Chrysobothris femorata).
2. Making tunnels in the bark :
    Fruit Bark Beetle. (Scolytus rugulosus).
3. Bases of buds perforated, the bark becomes discolored, and the leaves and fruit wither,—
    Pear-Blight Beetle. (Xyleborus pyri).
4. *Fixed to Bark* :
    a Flat, or saddle-shaped, or hemispherical dark brown scales. Large scales after mid-summer are brittle and contain only a whitish dust or empty egg-shells. Wintering forms are small and flattish,—
    Plum Lecanium. (Lecanium cerasifex).
    b Ashy gray appearance of bark of badly infested trees ; small gray, or black circular scales,—
    San José scale. (Aspidiotus perniciosus).
    c Mussel-shaped scales, with whitish eggs underneath in winter,—
    Oyster-Shell Bark Louse. (Mytilaspis pomorum).
    d. Bark scurfy with white scales, purplish eggs underneath in winter.
    Scurfy Bark-Louse (Chionaspis furfurus).

5. Producing longitudinal slits and eventually oval-shaped scars.
Buffalo Tree-Hopper (Ceresa bubalus).

C. *Attacking the Leaves* :

1. *Feeding in Colonies* :

a. Protected by webs in the forks of branches.
American Tent Caterpillar, (Clisiocampa Americana).

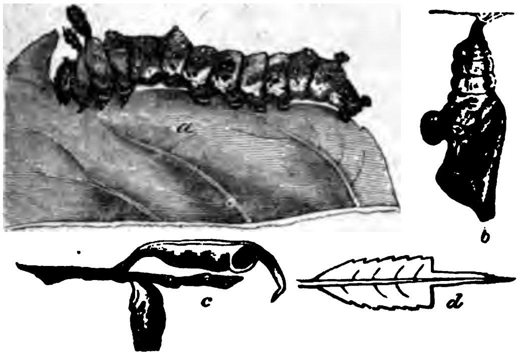

Fig. 91. Limenitis disippus, *a*. caterpillar; *b*. chrysalis: *c*. *d*. larval case.

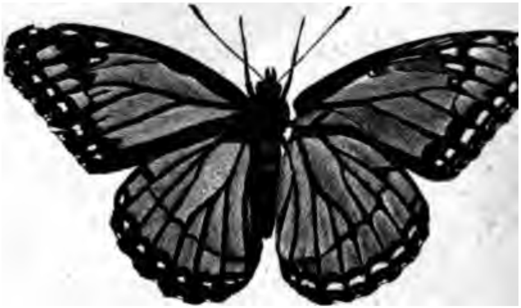

Fig. 92. L. disippus butterfly: colours orange-red and black.

b. Protected by webs covering the leaves.
Fall Web-worm (Hyphantria cunea).

c. Not protected by webs, greenish lice with sucking mouths.
Plum Leaf Aphis (Aphis prunifolii).

2. *Solitary* :

a. Measuring worms feeding in the day time and in spring.
Canker worms (Anisopteryx pometaria).

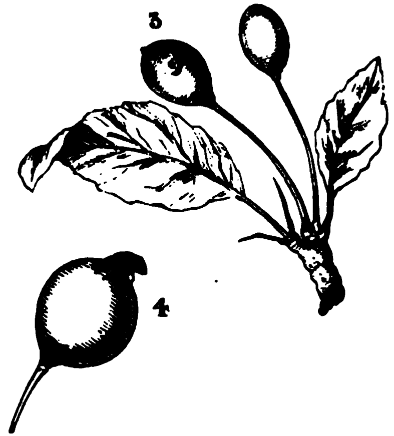

Fig. 93. Plum Curculio attacking young fruit; 3 crescent mark; 4 beetle puncturing fruit.

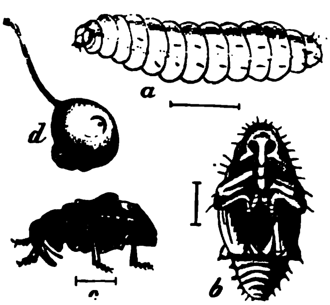

Fig. 94. Plum Curculio: *a*. larva; *b*. pupa; *c*. beetle; *d*. natural size on young fruit.

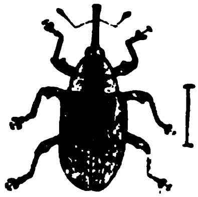

Fig. 95. Plum Gouger (magnified).

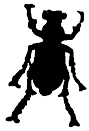

Fig. 96. Rosechafer.

b. Fat, greasy caterpillars, feeding at night in spring.
Cutworms.

c. Hairy Caterpillar, with long black plumes over head and tail.
Tussock Moth (Orgyia leucostigma).

d. Large buzzing beetle.
June Bug (Lachnosterna fusca).

e. Large apple-green caterpillar, with a tail horn, and with seven broad, oblique white stripes along each side.

Plum Tree Sphinx **(Sphinx drupiferarum).**

Other larvae are occasionally found feeding on the leaves of plum :

The Viceroy (Limenitis disippus), figs. 91 and 92, Polyphemus and Cecropia.

D. *Attacking the Fruit* :

1. Puncturing and making a crescent-shaped slit in the skin of the young fruit, which soon drops.

Plum Curculio **(Conotrachelus nenuphar) figs. 93 and 94.**

2. Making a round hole in the young fruit.

Plum Gouger **(Coccotorus scutellaris) Fig. 95.**

3. Eating holes in the ripe fruit.

Bumble Flower Beetle **(Euphoria inda).**

4. Eating holes in the half ripe fruit.

Rose Chafer **(Macrodactylus subspinosus), Fig 96.**

KEY TO PEAR INSECTS.

A. *Attacking the Root* :

1. Large yellowish-white borer, with a brown head, boring holes in the roots.

Broad necked Prionus **(Prionus laticollis), Fig. 97.**

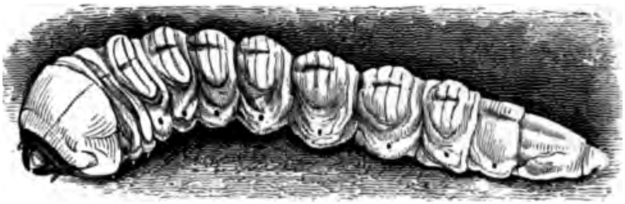

Fig. 97. Prionus laticollis grub.

B. *Attacking the Trunk, Branches, and Twigs* :

1. The following insects which attack apple (which see) also attack pear.

Round Headed Apple-Tree Borer **Saperda candida).**

Flat Headed Apple-Tree Borer **(Chrysobothris femorata**

Oyster Shell Bark-Louse **(Mytilaspis pomorum).**

Scurfy Bark-Louse **(Chionaspis furfurus).**

San José Scale **(Aspidiotus perniciosus).**

2. Large soft whitish larvae boring deeply into the wood.

Pigeon Tremex **(Tremex columba).**

3. In the Spring (May) much honey dew at axils of leaves on smaller twigs, and small yellow jumping insects in the sap, foliage yellowish.

Pear-Tree Psylla **(Psylla pyricola).**

4. Perforations at the base of some buds ; twigs blighted and leaves withered about midsummer.

Pear-Blight Beetle **(Xyleborus pyri).**

C. *Attacking the Buds* :

1. The following insects which attack the buds of the apple (which see) also attack those of pear.

Oblique Banded Leaf-Roller **(Cacoecia rosaceana).**

Eye Spotted Bud-Moth **(Tmetocera ocellana).**

Canker Worms **(Anisopteryx pometaria).**

D. *Attaking the Leaves* :

1. A slug-like, slimy larva feeding in July and September on the tissues of the upper side of the leaves.

   Pear Tree Slug (Eriocampa cerasi).

2. " Reddish blister spots 1-8 inch or more in diameter appearing on leaves in spring, and changing to black corky spots in July, each with a minute opening in it."

   Pear Leaf Blister (Phytoptus pyri).

2. The following insects which feed on the leaves of apple (which see) also feed on the leaves of pear.

   Red-Humped Apple-Tree Caterpillar (Oedemasia concinna).
   Fall Web-Worm (Hyphantria cunea).
   Tent Caterpillar (Clisiocampa).
   Yellow necked Caterpillar (Datana ministra).
   Canker Worms (Anisopteryx).
   Bud Moth (Tmetocera ocellana).
   Tussock Moth (Orgyia leucostigma).
   Cecropia Moth (Samia cecropia).
   June Beetle (Lachnosterna fusca).
   Goldsmith Beetle (Cotalpa lanigera).

E. *Attacking the Fruit* :

The following insects, which attack the apple and plum (which see) also attack the pear.

Codling Moth (Carpocapsa pomonella).
Plum Curculio (Conotrachelus nenuphar).
Bumble-Flower Beetle (Euphoria inda).

Key to Cherry Insects.

A. *Attacking the Root* :

1. Thick whitish grub, with brown head and legs, feeding in decaying roots. Beetle large with powertul mandibles.

   Stag-Beetle (Lucanus dama), Figs. 98 and 99.

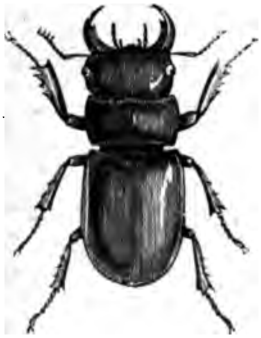

Fig. 98. Stag-beetle.

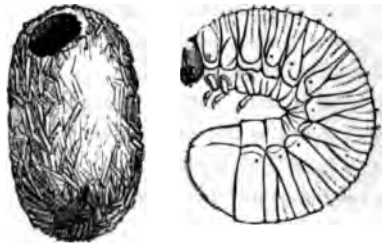

Fig. 99. Stag-beetle, cocoon and larva.

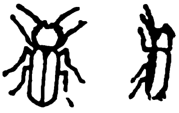

Fig. 100. Apple Twig-borer.

2. Large white fleshy grub, with reddish head, feeding in old roots.

   Rough Osmoderma (Osmoderma scabra).

B. *Attacking the Trunk, Branches and Twigs* :

1. A snout-beetle, gnawing the twigs and fruit.

   Imbricated Snout-Beetle (Epicaerus imbricatus).

2. A small beetle boring into the branches just above a bud, and burrowing downwards.
Apple-Twig-Borer (Amphicerus bicaudatus), Figs. 100, 101.

3. A flattened grub tunneling in the bark and sap-wood ; beetle bronzy metallic.
Divaricated Buprestis (Dicerca divaricata).

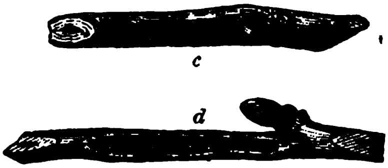

Fig. 101. Twigs showing work of Borer.

4. Large sucking insect with transparent wings inflicting wounds on the smaller limbs, and depositing eggs therein, in August and September.
Dog-day Cicada (Cicada tibicen).

5. Small circular scales, black in winter, with a circular depression about a central nipple.
San José scale (Aspidiotus perniciosus).

Attacking the Leaves :

1. A small beetle feeding on the leaves of red cherry.
Cherry-Leaf Beetle (Galerucella clavicollis).

2. A slug, shiny, dark-green, ½-inch long, feeding on soft tissues leaving the veins.
Pear or Cherry Slug (Eriocampa cerasi.)

3. Shining black plant-lice, infesting the terminal twigs chiefly, which become distorted and discolored.
Cherry Aphis (Myzus cerasi).

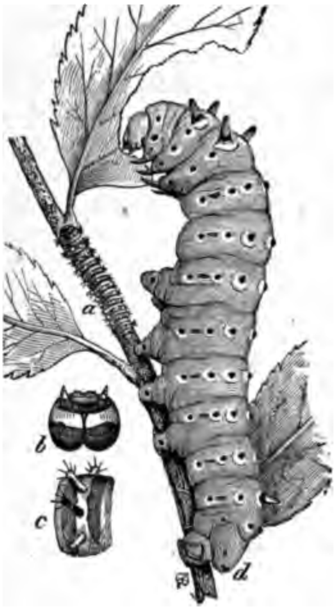

Fig. 102.
Callosamia promethea caterpillar.

4. Large bluish-green caterpillar, 2 inches long, with blue warts on each segment, and coral-red ones on 3rd and 4th segments.
Promethea Moth (Callosamia promethea), Fig. 102.

5. Large pale-green spiny caterpillar, striped on each each side with white and lilac.
Io Moth (Hyperchiria Io).

6. Caterpillars in colonies protected by webs in forks of branches, in spring.
American Tent Caterpillar (Clisiocampa Americana), and *Forest Tent Caterpillar* (not in webs).

7. Caterpillars in colonies not protected by webs covering the leaves in summer and early autumn.
Fall Web-Worm (Hyphantria cunea).
And other insects, most of which also attack the leaves of apple.

D. *Attacking the Fruit* :

1. Making a crescent cut on the cherry ; grub, white and footless, with a brownish horny head, feeding within. *Plum Curculio* (Conotrachelus nenuphar).

2. Yellowish white maggots feeding on the pulpy juices near the pit, inducing a rotting. (Cornell Bull. 172).
Cherry Frit Fly (Rhagoletis cingulata).

Key to Peach Insects.

A. *Attacking the Root and Lower Trunk* :

1. Tunneling in the bark and sap-wood of the root, causing an exudation of gum, which is seen at base of tree mingled with the castings.

   Peach Tree Borer (Sannina exitiosa).

B. *Attacking the Trunk and Branches* :

1. In early spring, a minute caterpillar bores into the shoots of new leaves, killing the growing terminals.

   Peach Twig-Borer (Anarsia lineatella).

2. Black hemispherical scales attached to the bark.

   Peach Tree Lecanium (Lecanium persicæ).

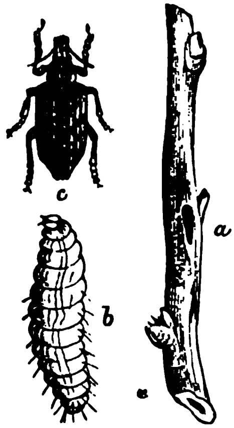

Fig. 103, New York Weevil.
a. Hole in twig made by female.
b. Larva ; c. Beetle.

3. A beetle eating the buds, and gnawing into the base of the twigs, causing them to break and fall.

   New York Weevil (Ithycerus noveboracensis), Fig. 103.

4. Round scales, gray or black, twigs presenting a scurfy appearance.

   San José scale (Aspidiotus perniciosus).

5. Oval scars and longitudinal slits on back.

   Buffalo Tree-Hopper (Ceresa bubalus).

C. *Attacking the Leaves* :

1. Plant lice, living in colonies under the leaves, causing them to thicken and curl.

   Peach-Tree Aphis (Myzus persicae).

2. Minute round scales, usually along the veins.

   San José scale (Aspidiotus perniciosus).

3. *Caterpillars protected.*

   a. In a tortuous tube.

   Leaf Crumpler (Phycis indiginella).

   b. In folded leaves.

   Oblique banded Leaf-Roller (Cacoecia rosaceana).

D. *Attacking the Fruit* :

1. Long legged, yellowish beetles eating holes in half-grown peaches.

   Rose-chafer (Macrodactylus subspinosus).

2. Large yellow hairy beetles, eating holes in ripe peaches.

   Bumble-flower Beetle (Euphoria inda).

3. Small snout-beetles making a puncture and crescent in the young fruit.

   Plum Curculio (Conotrachelus nenuphar).

NOTE ON INSECTS INJURIOUS TO PINES.

By W. Hague Harrington, F.R.S.C., Ottawa.

One of the features of Canada is the great forest belt which covers so large a portion of it, and which yields annually so important a revenue to its inhabitants. This magnificent forest stretches far inland from either ocean and northward forms an uninterrupted zone across the continent. Among the conifers which constitute so large a portion of this great forest area the various pines are prominent, and in the past they have been the chief source of wealth to our lumbermen who have already cut them over large areas. For many years I have seen each summer the rafts of white pine floating down the Ottawa, while the output of sawn lumber along the river has mounted annually into the hundreds of millions of feet.* On all our eastern rivers the same thing has been seen to a greater or less degree. The constant stream of logs coming down all the tributaries has testified to the richness of the limits upon which they are cut. Not to quantity alone do the pines owe their value, the wood of their splendid trunks is surpassed by that of few other trees in general utility. More than one-third of all our forest exports are the produce of the pines, from the sale of which we derive annually several millions of dollars, in addition to all that is used for home consumption.

So lofty and noble are these splendid lords of the forest that it might be thought that they are secure from all foes except the devastating axe and cruel fire. Yet few of our trees are attacked by so many enemies; small and individually insignificant, but occurring in such abundance sometimes as even to destroy and overthrow the forest giants. To enumerate all these would be beyond the scope and bounds of a paper for this report. One hundred species of insects injurious to pine were mentioned in Bulletin 7 of the U.S. Entomological Commission published in 1881, while in the Fifth Report of the Commission (1890) the number was increased to one hundred and seventy, requiring for their discussion, even briefly, one hundred and thirty-six pages. Mr. A. D. Hopkins has also enumerated many species in his valuable "Report on Investigations to Determine the Cause of Unhealthy Conditions of the Spruce and Pine from 1880-1893;" Bulletin 56 West Virginia Agric. Exp. Sta., April, 1899.

My intention in this note is only to call attention to some of the principal species which I have observed myself as infesting these trees, omitting the lepidoptera, of which various species feed upon the foliage, and also a great many members of other orders which do more or less injury. To the trunk and branches the most serious injuries are done by beetles, which belong chiefly to the families Buprestidæ and Cerambycidæ. The beetles of the first family are somewhat flattened and elongated, with short antennæ, and generally are very hard and with a metallic lustre or bright colours. Some of the most gorgeous of all coleoptera are found among the tropical representatives of this family. The larvæ of these beetles are somewhat tadpole-shaped and flattened, and are very destructive to the trees they infest. Fig. 104.

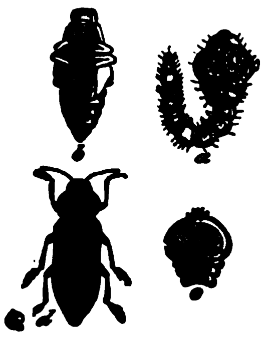

Fig. 104.—Flat-headed Borer (Buprestidæ). *a* and *c*, grub; *b*, pupa; *d*, beetle.

The three largest species upon pine belong to the genus Chalcophora, viz., *C. fortis* Lec., *C. Virginiensis* Drury and *C. liberta*, Germ. All these occur in abundance in spring and autumn either upon the trunk and branches, or in the leaf clusters, where they appear to feed upon the buds. *C. fortis* is the largest species, measuring over an inch in length, and is distinguished by its brighter colour and the more sharply elevated lines upon the wing-covers; *virginiensis* is slightly smaller and smoother, and is duller in colour, while *liberta* is generally still smaller and is more ruddy in appearance, although some individuals may be quite dark. Other species of buprestidæ are *Dicerca tenebrosa*, Kirby, *D. divaricata* Say (Fig. 105) *Chrysobothris dentipes* Germ., *C. Blanchardi* Horn, *C. Harrisii* Hentz, *C. trinervia* Kirby, *C. scabripennis* L. & G., *Buprestis striata* Fab., *B. maculiventris* Say, *B. consularis*, Gory, and *Melanophila longipes*, Say. On our Pacific coast the genus Chalcophora does not appear to be represented, but members of the other genera are common.

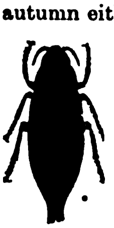

Fig. 105.—Dicerca divaricata beetle.

The second group of injurious timber beetles is that of the Cerambycidæ or long-horned beetles; the antennae, especially in the males, being often much longer than the body. The larvæ of these beetles are generally not quite so much flattened as are those of the Buprestids, but their habits are much the same. The eggs are placed in the bark in crevices or punctures made by the female, and the larva when hatched bores at first in the bark, then reaching the outer layers of the wood it feeds upon them, and gradually as it increases in size it works deeper into the solid wood. The largest and one of the commonest of our pine-boring beetles is *Monohammus confusor*, Kirby, a grey beetle with very long antennæ (Fig. 106). Its larva, when full grown, is about an inch and a half long, and is armed with a powerful pair of mandibles with which it eats its way rapidly through the wood. Standing near a pile of infested sawlogs one can distinctly hear the *crunch, crunch*, of the destroying grubs. This species occurs from the Atlantic to the Pacific and varies little in appearance. Another common species is *M. scutellatus*, Say, (Fig. 107)—a black beetle, with slight white markings which are often nearly rubbed off. It has also a wide distribution, but the western specimens vary slightly in appearance and were described as a separate species (*M. oregonensis* Lec) Other species of the genus are *M. tittilator* Fab., *M. maculosus*, Hald. and *M. marmorator*, Kirby, all found in Canada in greater or less abundance in different localities. These five species often cause considerable loss to our lumbermen, by their depredations upon sawlogs. Logs left in the woods for a year, through breaking up of roads, or lack of water, etc., are often so badly damaged as to greatly lessen their value. This damage can be prevented by removing the bark from the logs in spring, but this means a considerable expense, even when practicable. Other long-horned beetles infesting the pines are *Tragosoma Harrisii*, Lec., *Asemum mœstum* Hald. (Fig. 108), *Criocephalus agrestis*, Kirby, *Rhagium lineatum*, Oliv., etc.

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* The quantity sawn during 1902 in the Ottawa district has been published as 620,000,000 feet.

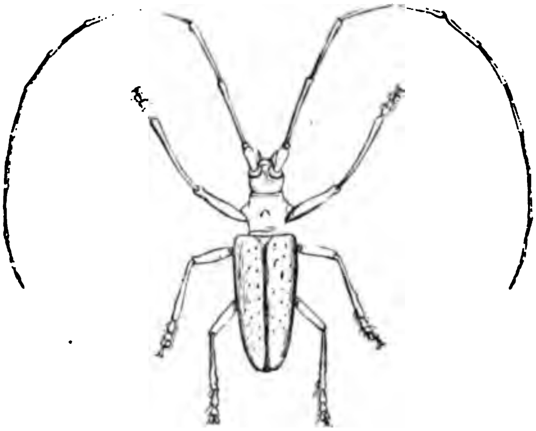

Fig. 106.—Monohammus confusor.

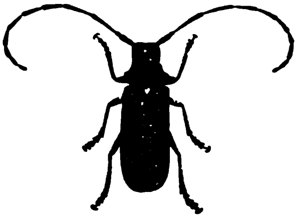

Fig. 107.—Monohammus scutellatus.

Another group of destructive beetles is the Scolytidæ. These are quite small insects; the largest scarcely over one-quarter of an inch long, and some very minute. They are, however, exceedingly destructive, as they occur in great numbers, and attack both injured and healthy trees, some species boring even into the bark of young trees. The mother beetle tunnels a groove an inch or more long under the bark, and inserts eggs at intervals. The larvæ, when hatched, eat outward in all directions, producing in some instances quite regular and effective patterns radiating from the parent burrow. Each colony loosens a portion of bark of several square inches, and when, as is often the case, the colonies are in close proximity to one another, the bark is loosened over large areas of the tree's surface and the sap layers of the wood are destroyed, thus causing the death of the tree. Among common species may be mentioned, *Pityophthorus sparsus*, Lec., *Tomicus pini*, Say, *Dendroctonus terebrans*, Lec., and *Hylurgops glabratus*, Zett.

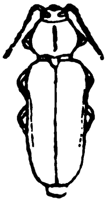

Fig. 108. Asemum mœstum.

There are also several destructive beetles belonging to the Rhyncophora (snout-beetles or weevils), which occur abundantly. The most important of these belong to the genera Hylobius and Pissodes, and are very common about millyards as well as upon the pine trees. *H. pales*, Hbst. and *H. confusus*, Kirby, infest the trunks and limbs, boring under the bark and through the outer wood layers. *P. strobi*, Peck, infests the young shoots, in which the eggs are placed at intervals, and in the pith of which the grubs burrow, causing the shoots to die and wither. The terminal shoot is frequently affected, thus checking the upward growth of the tree, and causing it to become forked, or to have a crook in the trunk. *P. affinis*, Rand., is another common species.

Besides all the beetles that infest the trunk, branches and twigs, there are many insects preying upon the foliage. They include the caterpillars of various moths, and the young of several bugs, known as spittle-insects, also beetles, plant-lice, etc. Several sawflies belonging to Lophyrus and Lyda live upon the pine leaves, and sometimes occur in such numbers as to seriously defoliate them. A kind of gall, or swelling of the twigs is formed upon the red pine by the larva of a little snout beetle, *Podapion gallicola*, Riley, and the cones of both red and white pines are infested by the larvæ of a scolytid, *Pityophthorus coniperda*, Schwartz, which cause them to become aborted and prevent the development of the seeds.

Mention has been made of only a small number of the insects infesting our valuable pines, and in the briefest way, but even these few notes will indicate the great number of enemies they possess, and the vast amount of injury which is effected in the aggregate, by these individually insignificant little foes.

A TALK ABOUT ENTOMOLOGY.

By J. Alston Moffat, London, Ont.

It has been said by a wag, "That Entomology is the science that gives to insects long names, short lives and a pin through the middle." That bit of humour with its absence of correct information, its jocular misrepresentation, and its implied disparagement of the subject, reflects, fairly well, the condescending attitude assumed towards it, by the great majority of every community, who seem to regard it as the frivolous pastime of a few harmless lunatics, that might be better employed, but who are yet more to be pitied than blamed. Such being the common view of entomology entertained by the multitude, it is not surprising that so few should be found willing to turn their attention to it, either as a science, or for its economic bearing on the prosperity of the community, or as a recreation. Indeed, it requires a firm conviction of its value and importance in the world by those engaged in it, or the great pleasure derived from a study of it which it brings to themselves, to make them willing to endure the faintly disguised wonder and disdain they are exposed to. Many a youth with a fine appreciation of the beauty of insects has been driven from following out his inclinations by the jibes and jeers of his less favored companions.

The ever-ready excuse for avoiding entomology as a subject of earnest consideration, is the long names in a language they do not understand. That will be no obstacle in the way of anyone really desirous of understanding the subject. Names are a necessity. The design of names is to distinguish between things that differ. The value of scientific names is that they are all in unchanging language that makes them uniform the world over, regardless of what the vernacular may be. Such a condition is necessary for the systematic arrangement and classification of the objects named, without which science could not exist. The name of any object in any language must be learned before it can be known and remembered. But once the object and its name are associated together in the mind, all difficulty with the matter vanishes, and it matters comparatively little what the name may be, so long as the object is familiarly known by it. Its meaning, if it has one, will come in due time. What some seem to want to get is a name that will give them the size, form, colour and general appearance of the insect, so that they will know it when they see it, without having learned it—an impossibility in any language, especially where there is such a multitude of slightly differing forms as there is in entomology.

Great diversity has been, and is being displayed by describers in giving names to insects. Some have had the faculty of choosing names for their species that are short, pretty and appropriate. Others have so multiplied syllables in their names, as to make it difficult even for an expert to pronounce them ; yet even with these a little familiarity makes it easy. Visiting at a friend's one evening, a lady and her daughter were present. The Walking-stick insect, *Diapheromera femorata*, was brought up in conversation. For their amusement, I went over the encyclopedic description of the creature. "Filiform and linear, entirely apterous, without elytra and destitute of stridulation." "Dutch," said the daughter. "Not at all; excellent English," said I. The mother, who had been attentively listening, and who understood German, remarked : "I knew it wasn't Dutch, but I didn't think it was English." So the trouble is really in unfamiliarity with the terms used, rather than in the language in which they are given. Some of the older heads in entomology are at present suffering great inconvenience from the changing of scientific names, in obedience to the demands of the law of priority, which is causing so much confusion, as to make them think that permanence in nomenclature, which gives opportunity for becoming familiar, is of far more importance than the names themselves. In this connection I copy the following paragraph from "The Introduction to the Report on *Ophiuroidea*," by Theodore Lyman. In the voyage of H. M. S. Challenger. (Vol. V, Page 5).

"In the description of this monograph, I have tried to use simple words as often as possible, and not to add to the jargon in which zoology is now smothering. In addition to a gigantic classification, to form which the dead languages have been torn up and recomposed, there is an ever-growing crop of anatomical and embryological terms. No callow *privat docent* but thinks he does good service in adding a score of obscure words to define his ephemeral theory. Doubtless he is not aware that his work has two faces. First, as regards himself, these new words of his have become familiar and convenient in a subject he has long studied. Secondly, as it regards his readers, not only have they never heard the new words, but have perhaps known the parts referred to by other names. They must therefore, go through three painful processes : - (a) Commit to memory, with dreary labour, like sawdust-swallowing, the novel words. (b) Learn to what parts they apply. (c) Carefully forget the old terms."

"The result of this system has been, not a language, but a jargon, such as Moliére would scarcely have ventured to put in the mouths of the medical faculty in his Malade Imaginaire."

There are more than two hundred thousand different kinds of insects known, described and named even now, and the work is not yet nearly complete, so there are many new names yet to be got for new species. Then there are the varieties to cognominate ; and in some instances these are numerous. In one case it takes sixty-two distinct names to label the species. And when we consider that duplicating of names is to be avoided, we get some insight to the difficulty of providing suitable names for such an host. The effect produced by those long and mysteriously high-sounding appellations upon people with vigorous imaginations is often quite surprising. They are inclined to picture to themselves a creature proportionately formidable to the name as it appears to them. Many amusing instances of this might be given.

On one occasion when exhibiting my collection at a fair, a young man with his female friend came along ; but their tastes appeared to run in opposite directions. He called her attention to the butterflies, she said she could see butterflies any day. Then look at this grasshopper he persisted himself scrutinizing it closely. Seeing that he was an interested observer and wishing to detain him, I said, call that a grasshopper? 'Yes. What do you call it?' *Conocephalus ensiger*. There now, said the girl, you go home and see if there is anything like that about your place. Oh no, he replied. If there was, I would sell out and leave!

Being on a visit one evening to a place where some attention had been given to collecting, a *Polyphemus* cocoon was placed on the table to interest the company. A young man eyed it suspiciously, reached out towards it timidly, and as his fingers were coming in contact with it, I called, hah! which caused him to draw back suddenly. This raised a laugh at his expense, and he then prepared for an exhibition of boldness; when I remarked, "The man does not know the risk he is running." Turning to me in all seriousness he enquired: 'What is it anyway?' Confident in the ignorance of the company in regard to names, I said, 'Why it is a *Boletotherus cornutus*.' "Oh, bejove, I won't have anything to do with it then." And he didn't.

The accusation that entomologists shorten the lives of a few insects in the pursuit of their science is quite true. But this profession of sympathy for insects is usually made on behalf of some beautiful and seemingly harmless butterfly, overlooking the fact that the handsome creature may produce an offensive looking and destructive grub. I have yet to hear the first expression of regret for the death of a potato beetle, but I have heard a lady taking credit to herself for stepping on every one she saw on the pavement. And yet the lives of each are equally valuable to the owners thereof. Upon one occasion I secured a prize in a place of public resort, and was taken severely to task by an elderly lady, for my cruelty in depriving of life such a beautiful and harmless creature. I defended myself by asking a question: Suppose you saw a caterpillar crawling on your dress, what would you do with it? "Oh, the nasty thing. I would knock it off and put my foot on it." In so doing you would be taking the life of just such a beautiful creature as I did, only in a different form. That did not change her opinion of me. Thus, feelings are allowed to control reason and judgment. A poet has asked: What's a butterfly?" And answered: "At its best, 'tis but a caterpillar drest."

It is no unusual thing to hear individuals when looking at a case of butterflies, go into raptures over their beauty, and extol the marvellous works of the Creator; but when confronted by one of beetles, they will express their horror and disgust at what they regard as most objectionable creatures; and yet they were originated by the same inventor, and are products of the same workshop, and the one exhibits as much wisdom and beneficence in their construction, and as perfect an adaptation to their requirements in nature as the other. And our duty is to endeavour to discover and disclose wherein that lies, so that we may be able in some measure to give an answer to that oft repeated question: "What were insects made for anyway?"

When Topsy was asked "Who made her," she said she wasn't made, she grew; and in any correct use of language Topsy was right. Its a long while since any living thing was made in this world, and yet there was a time when no living creatures existed on this globe. Therefore, they must have been originated at some time, and in some way. And the accumulated evidence strongly vindicates the belief that they were originated by design, for a purpose. And ever since, those who have survived the fluctuations of time, have kept on propagating their kind in accordance with the laws of their being with which they were originally endowed. Moulded and modified in many ways by external conditions and altered circumstances, the better to fit them for performing their part in assisting to maintain the balance of nature. Man being, preëminently the disturber of harmony in this world.

As to the "Pins" which are so much in evidence in a collection of insects, they are a necessity for the handling of specimens without injury when under examination, as well as to carry labels and fix them firmly in place for future observation and study. Many observant persons when looking at a collection of insects, will express great surprise at the number of kinds therein displayed that they have never seen before, and wonder that it should be so. But it is just what might be expected, as a great many insects cannot be distinguished from one another when flying about. It is not until they are captured, killed, pinned and spread, that the difference between them can be discovered. Yet many people see nothing in the pins but an evidence of cruelty on the part of collectors. No intelligent collector of the present day would think of pinning an insect before killing it, when there are so many approved methods of giving them pleasantly and instantly everlasting sleep ; and thereby secure his specimens in perfect condition by preventing fluttering. Much misinformation prevails even amongst educated persons about the suffering of insects, which is not quite creditable to them. Suffering is the result of being possessed of a nervous organization. The more highly this organization is developed, the more sensitive to suffering is the creature possessing it. All creatures are not thus equally endowed, therefore all creatures are not equally liable to suffering. The human race is supposed to stand highest in this respect, and yet there are wide differences between individuals of it. A highly cultivated and refined woman is far more liable to suffering, mental and physical, than one who has been exposed to rough conditions all her life. Insects have a very low organized nervous system, and therefore are not, and cannot be, liable to acute suffering. Apart from the science of life in that respect, it has been abundantly demonstrated. As an illustration : A moth asleep in day time on the side of a tree, has had a pin passed through its body, and firmly fixed to the tree without disturbing its repose. It remained in that condition without showing signs of its discomfort until evening came, when it wanted to fly about, then it fluttered vigorously ; which might have been mistaken by an observer as an evidence of suffering, when it was only the result of its eager desire to indulge its nocturnal habit. I have cut half the abdomen off a mosquito that was feeding, and it did not injure its appetite in the slightest. But it is our nature to associate suffering with injury, therefore it should not be wantonly indulged in. Children especially should be taught to deal mercifully with every living creature, even a mosquito, and dispatch it as expeditiously as possible, to save others from suffering. But I have heard boys condemned as wicked and cruel when chasing and capturing butterflies, and peremptorily ordered to stop it, which was intended as a fine exhibition ot tender consideration for the feelings of the insects, whilst it showed none whatever for those of the boys. Surely a boy is of more value than many insects. Sentimentalism, however lofty, is not edifying.

Man's prerogative in this world is to dominate nature, and make the powers of nature subservient to his advancement, and all modern progress and improvement in horticulture, agriculture and stock raising, is founded on the principles of man's ability to improve upon nature for his own benefit. But to accomplish that, man's work must be in harmony with the laws of nature, else disaster may follow. Nature when left to the operation of its own beneficient laws, succeeds in establishing and maintaining an exquisitely adjusted balance between the numerous conflicting elements in its own vast domain. But man in his eager desire for large profits and quick returns, thinks he can accomplish his ends by more direct methods ; ignorant of those finely adapted harmonies, he goes to work in his own way to bring them about, but often discovers to his sorrow, that he has started some of nature's machinery in motion that is working in an opposite direction to his intentions, and is threatening his ruin rather than his advancement ; so he has to call a halt, to reconsider his methods, and with patient labor, observation and research try to discover where he has gone wrong, what he has overlooked and how to do better. When Henry Ward Beecher undertook to be a farmer, he met with so many unforseen and unexpected hinderances to success, that it seemed to him as if all nature had joined in a league against him, and he was ready under the influence of such feelings to give that reply which raised such a storm against him at the time. When asked how to get rid of Canada-thistles, he said, "Cultivate them for the market. Then the bugs will attack them and the mildew will blast them. Then the grubs will eat their roots, and the caterpillars will devour their leaves. Their stocks will rot, and their blossoms fail to produce seed. The frost will cut them by night, and the sun will scorch them by day, and you will soon have no thistles." And this conflict between man and nature, is from his violation of the laws of nature, always going on ; and will, until he more thoroughly understands nature's laws and how to obey them. And the more artificial man's methods become, the higher is the intelligence required to make them successful.

The community may be divided into the rural and the urban, or such as live and work in the country, and those that make their living in towns and cities. It is the products of the rural workers' labour that are most exposed to insect depredations ; and, as a rule, it is they who give the least attention to such matters. The cause for this condition of things is not far to seek. The rural workers' labour and leisure are very unequally divided. Summer is short, and the work is pressing. The crops must be got in ; and the crops must be got off. And during the process there is little time and less inclination to give attention to the operations of their insidious insect foes, that may be robbing them of half the profit of their labours. In the winter time they have the leisure to gain information, but it is not the season to put it in practice to any extent ; so with the next summer's advent the usual rush begins, and their time as well as their inclination for that kind of work disappears, and their attention to the depredations of insects is put off to the future.

An idle man out for a stroll, and a delightful health-refreshing converse with nature, reached a projecting point of the Niagara escarpment, situated about four miles east of Hamilton, from which, on a clear day, Toronto can be seen. The landscape below, once lake bottom, but now dotted with human habitations that are surrounded by regularly laid out and well cultivated fields, orchards and vineyards, their dimensions reduced by distance, until they look like flower-beds in a well kept garden, with Lake Ontario shining bright and calm beyond. A prospect of charming loveliness. A woman came out of a harvest field near by, dressed suited to her work, but quite different from what she wore when he had met her in the city. She thought it necessary to apologize for her appearance, and kept it up to his discomfort. So to change the subject he remarked, "What a magnificent view you have from your place." The reply was, "Troth then and its much we care about the view, working like the slaves we are all the day." He could but bow to the justness of her rebuff, and ponder on its widespread and far-reaching applicability. No time—no inclination for such indulgence. Severe and continuous toil is not conducive to mental cultivation.

Amongst those that live and work in urban locations, where labour and leisure are more equally divided, there always have been some who were fascinated by the beauty of insects and their intensely interesting habits of life. Many of these in the pursuit of their favourite study have seen, realized and become impressed with the thought of what tremendous loss the rural workers are sustaining from the depredations of insects, and have persisted in calling attention to it, and urging that measures should be taken to prevent it. Their thoughtful consideration has not been without result. Governments, which have the interest of their country at heart, having had their attention called to the matter, and seeing that those most directly interested were, from want of time, knowledge or inclination, doing nothing, and that the whole community was suffering loss thereby, have taken hold of the matter, and are looking out for persons qualified in some measure by previous observation on the subject, and are appointing them to give their whole time and attention to that work. Such action is in perfect accord with the established principle of the division of labour for the attainment of the highest results with the least expenditure of time, money and labour. And the rural workers realizing the advantage of such an arrangement, will be willing to sustain the procedure, when they find it is profitable to have that done for them, which they may not have time or capacity to do for themselves ; and the whole community will be benefited thereby. So now the time has come when attention to the work and ways of insects is getting acknowledged to be of real importance in the management of rural affairs, which cannot well be done without, and work in that line will become an established profession. Men being educated for it, and their services having been found to be profitable will soon become necessary, when they will be called for as regularly and paid for as willingly as those of any other profession. Thus entomology has vindicated its claim to recognition as a science useful and important to the community.

The educational authorities are now alive to the great advantage that would result to the whole community if it were in some measure informed upon natural history subjects, and to that end have placed them in the lesson course of schools. But it is doubtful if a more effectual method could be taken of turning children against natural history than by making it one of the tasks they have to learn, and which the most of them will look back upon with dislike, and be glad to have done with. Whereas, if they were encouraged to make natural history collections, themselves choosing the department, it would be in harmony with their natural inclination to collect something, and would at the same time form a safe outlet for their surplus energy, which would produce such an agreeable impression on their minds as to go with them in after-life and induce them to take it up again whenever opportunity presented itself. A consummation much to be desired and which may be realized when parents and teachers themselves have acquired a real love of the subjects.

Mankind is instinctively utilitarian, and this is reputed to be the most utilitarian age that has been. The disposition of the race is being intensified in the individual, by the tendency of the times in which he lives. So everything is tested by the standard of: How is he, or they, to be benefited thereby? and to what extent? But the great majority of mankind have no choice in life, they are controlled by necessity, the necessity of making a living. And this so occupies their attention that they have little time for anything else. But constant application of mind or body to one particular vocation becomes monotonous and depressing. So for the health of body and mind, relaxation is necessary. Many suppose that such is only to be obtained by an entire absence of occupation; this is a mistake, the most refreshing relaxation is often found in a mere change of occupation. The most tiresome day of many a man's life is a holiday; simply because he has nothing to do. Activity is conducive to happiness. Many who have been successful in business, and have got over the necessity of working for a living, yet remain in business, because they have no other way of pleasantly and profitably occupying their time. Now here comes in the immense advantage which those possessed of some knowledge of natural history subjects have over those with none. A means of healthful recreation is always within their reach. All they have to do is to open their eyes and they find objects of interest liberally strewed around them. So that, whether it be the weary toiler with only his tiresome holiday to spend, or the successful man who has got beyond the necessity for labour, and has much time to spare, they will find in it a never-failing means of profitably occupying whatever time they wish to give to it. When the eyes are opened to the beauties of nature, the pleasure of a walk or a drive is immeasurably enhanced by the ability to intelligently recognize the diverse objects that are constantly presenting themselves to view. The enjoyment of rest and repose in the shade on a hot summer's day, is quadrupled by observing the different forms of the trees, with their characteristic manner of growth; and the kind of birds and insects that frequent them. And to be able to distinguish them by name as recognized acquaintances, is a yet greater addition to the pleasures of life. One great advantage of taking recreation in the observation and consideration of natural history subjects is, that it requires no elaborate preparation to begin with. Every one is able to appreciate in some measure the beauties of nature and the faculty will increase and strengthen with exercise, so that all that is required of anyone is to begin to observe. Observation excites curiosity, curiosity leads to enquiry, enquiry tends to increase knowledge, and the more one knows, the more one desires to know. And *natural history* subjects are so diverse in their manifestations, as to provide something suited to every taste. Then they are not the monopoly of the rich or the learned, but are open to all wh have an eye to see, and a mind to perceive. They are educational in their influences, leading to habits of thought, observation and self-control. They are elevating in their tendency, leading away from that which is base and ignoble, to that which is pure, beautiful and refining. Physically they are healthful; most departments requiring those out-of-door activities that brace and strengthen. And they are perfectly inexhaustible, and such a source of enjoyment, as only those engaged in them have the slightest conception of. Thus satisfying man's utilitarian disposition to the utmost.

In nothing of all that, does entomology fall short in interest and importance to any othe department of natural history. There are four times as many different kinds of insects in the world as of all other kinds of animal life put together, and their powers of increase may be reckoned at fifty times as great. Then insects have four separate stages of existence to investigate before you can be certain that you have an exact knowledge of their life history. Whilst the simple question, "What constitutes a species," amongst them, remains as yet wholly unsettled. If it is the beauty of nature that attracts your attention, you will find in insects the equal of flowers, with the added charm of animation; combining in colour and form the highest art with the poetry of motion. It is the strange and wonderful that excites your interest; no where in nature can be seen such marvels as in the transformations of insects such departures from the ordinary course of life in other creatures; such contrasts in conditions; from the lowly and grovelling, nourished on garbage; to the elegant and refined, revelling in the sunbeam and sustained by nectar. In their individual instincts along the lines of natural capacity, excelling in correctness the most cultivated reason of man. In the perfect adaptation of parts to their uses, they are far in advance of the inventive powers of a human genius, and in many instances they exceed in grotesqueness, the imaginative creatures of the wildest romancer. And whilst they are considered to be the ephemeral things of a day, their pedigree can be traced to the remotest antiquity; and no where else can be found such beautiful illustrations of natural theology. Thus providing abundant scope for the exercise of every faculty of the human mind.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

ANNUAL MEETING.

On Wednesday afternoon, Nov. 5, 1902, at the High school, Calgary, was held the fourth and last annual meeting of the North West Entomological Society. The meeting was one of very great interest, for it involved the extinction of the Entomological Society and the founding in its stead of the Territorial Natural History Society.

ENTOMOLOGICAL SOCIETY.

The chair was occupied, until the burial of the Entomological society, by the Right Revd., the Bishop of Saskatchewan and Calgary. The large room was crowded and among those present were Chas. W. Peterson, deputy commissioner of Agriculture, Regina; T. N. Willing, Regina; Dean Paget; Percy B. Gregson; N. D. Sanson, curator of Banff museum; F. H. Wolley-Dod; A. G. Wolley-Dod; C. Marker; Principal J. B. Boyce; Messrs. King, Tomlinson and about forty other residents of Calgary and district.

Letters in support of the meeting were received from the Mayor of Calgary and other gentlemen.

After an interesting opening speech by the chairman, Mr. Percy B. Gregson, as president of the Entomological Society, was called upon to address the meeting.

PRESIDENT'S ADDRESS.

Mr. Gregson said that the Society was now in its fifth year of existence and explained some of the difficulties that had to be overcome in the course of its establishment. Very early in the society's existence, botany was made a complementary subject with entomology, and by constantly hammering away, holding meetings and by pointing out on every possible occasion the manner in which agriculture was affected by insects and plants, farmers were interested in the welfare of the society.

One difficulty to contend with has been, not so much the prejudice of the young people against insects, but the prejudice of the parents, which however was passing away. The president then proceeded to describe the formation and operation of one of his field clubs. At first two or three boys would join for the fun of the thing—perhaps one of them might be in earnest—and a girl or two. In the afternoon they would go out, and from the varied assortment of things taken (bugs, beetles, spiders, caterpillars, butterflies, etc.) a caterpillar obviously parasitised would be selected, and the circumstance and importance of it explained. Then perhaps on another occasion the attacks of a small fly on the common prairie aster would be noted, and the young people asked to find one free of attack. They would by that process learn how very few plants there were which had no insects of any kind attacking them. The membership of the Lacombe Field Club now numbers 22, all filled with a sense of responsibility as naturalists. Three out of four who have gained prizes this year are members of this field club, and these prizes were gained against a competition open to all the Territories.

There is now also being organized at the Red Deer school a field club for that district on the lines of the Lacombe Club, so that next year (if all is well) there will be two such clubs in full operation.

Speaking as to the use of the study of entomology, or botany, or any other subject of natural history, Mr. Gregson said that even looking at it as a hobby there is this value in a hobby, that of a definite purpose in view. But there are other uses. Botany is the study of the life history of all plants. It teaches us their modes of growth, habits, natures, localities, etc., so that we learn just how they affect the farmer for good or bad, and in the prize competitions for this year it was made a special condition that the collections should specify these particular features. Then take entomology. This means the study of the life history of all insects. It is not enough to simply know the names of the insects, though that is a good step forward, but their habits and life history from the time they hatch from the egg until they undergo their final change must be learnt as far as possible, and as we learn so our interest grows and our collections should show this life-history.

Another use of the study of natural history is the remarkable development it induces of the faculty of observation—in the young especially. It is extremely interesting to watch this development. About two years ago one of the young folk to whom Mr. Gregson is teaching entomology came to him and said: "Mr. Gregson, I shall never get a collection, there are so few insects." He was told to persevere, and this summer he said: "Mr. Gregson, there seem to be insects everywhere."

This is a young boy—a boy 12 years old—who has gained the first prize in entomology this year. His collection was handed around the room and excited much interest. Another is the love of nature which these studies cultivate—one of the most valuable possessions one can have, and it is well that this should be cultivated while we are young.

As an almost natural corollary with the work of the entomological society, plans have been formulated for the establishment of natural history museums at the schools of Red Deer and *Lacombe, which* the pupils are intended to collect for and augment every year. These museums are designed to include every subject of natural history (plants, insects, fossils, minerals and other geological specimens, birds, shells, etc.) a few cases for each school have already been ordered to be constructed as a start.

Such, then, is the history of the North West Entomological Society up to the present day.

Letters were then read from J. A. Calder, deputy commissioner of education, Regina ; Professor C. C. James, deputy minister of agriculture, Ontario ; H. H. Lyman, late president of the Ontario Entomological Society, etc., expressing the most favorable opinions with regard to the course adopted.

PRIZE WINNERS.

Mr. Gregson then announced the names of the winners of the prizes in Territorial competition for insects and plants. The winner of the prize of $2.50 (given by Dr. James Fletcher, Ottawa), for best collection of injurious and beneficial insects is Master D. Tipping, Blackfalds. The prize given by the society for best numerical collection of insects was won by Master Benjamin Howell, Lacombe. For best collection of plants, the prize of $2.50 (given by Dr. Fletcher) was won by Miss Lucy Howell, Lacombe ; and second prize (given by the Society) was won by Miss Mary McDonald, of Urquhart.

The balance sheet was then read, showing a deficit of $40. (A special donation of five dollars has since been received from Mr. H. H. Lyman of Montreal).

DISSOLUTION OF THE SOCIETY.

Mr. Gregson then stated that he had now arrived at one of the saddest episodes in the history of the Entomological Society, namely, its suicide. He proposed that the Entomological Society should be discontinued, and explained that this did not mean oblivion, for that from its ashes would arise, he trusted, a society with greater scope for work, on the lines of a natural history society for the Territories and on this basis he understood that the existing members would transfer their allegiance to the proposed new society.

Before proceeding with the new business, Principal Boyce expressed his desire to assist in the formation of a museum at Calgary and Mr. Tomlinson offered to help the young collectors and others in every way he was able towards that end, and Mr. Gregson promised his advice and cooperation.

Moved by T. N. Willing and seconded by C. W. Peterson, that a vote of thanks be extended to the officers of the Entomological Society for the energetic and untiring way in which the affairs of the Society have been conducted. This was carried.

Moved by Mr. Gregson, and seconded by Mr. A. G. Wolley-Dod that a vote of thanks be extended to the chairman, His Lordship the Bishop of Saskatchewan and Calgary.—Carried.

TERRITORIAL NATURAL HISTORY SOCIETY FORMED.

Moved by Mr. Gregson and seconded by Mr. A. G. Wolley-Dod that a new society be formed under the title " The Territorial Natural History Society " with fee of one dollar for Membership.—Carried.

The following are the objects which this society has been organized to carry out, viz :—

(a) To instruct farmers how to recognise beneficial and injurious insects, weeds and birds, and how to combat those that are injurious.

(b) To promote an interest in and the study of the economic and scientific phases of the various branches of Natural History.

(c) To establish one or more Natural History Museums at central points, and Collections in connection with Schools throughout the Territories.

Mr. Chas. W. Peterson was then elected to take the chair, with Mr. T. N. Willing as secretary pro tem. for the proceedings.

Moved by Mr. N. B. Sanson, and seconded by Mr. F. H. Wolley-Dod that the Divisions of Entomology, Botany and Ornithology be at once established.—Carried.

A draft of the constitution of the Territorial Natural History Society was then considered section by section and finally the same was adopted.

The following officers were then elected :

President	Percy B. Gregson.
First Vice-Pres.	C. W. Peterson.
Second Vice-Pres	G. Wolley-Dod.

Directors, Entomology, F. H. Wolley-Dod, Calgary, and Rev. J. Hinchcliffe, Red Deer; Botany, Mr. Nivens, Prince Albert, and Mr. Hutchinson, Regina; Ornithology, Dr. Henry George, Innisfail, and F. Dipple, Calgary, and T. N. Willing, Regina, Secretary-Treasurer.

It was decided that the report of the president of the late North West Entomological Society should be included in the first annual report of the Territorial Natural History Society, and also inasmuch as the excellent work done by the Entomological Society led to the formation of the Natural History Society, that the liabilities of the former be assumed by the latter.

It was resolved that three official Museums should be established, one at Blackfalds for the district north of Calgary, with Mr. Percy B. Gregson as Curator; one at the Territorial capital (Regina), with Mr. T. N. Willing as Curator; and the third at Calgary, with Principal J. B. Boyce as Curator.

A resolution was adopted unanimously urging the Territorial government to provide at the earliest possible moment the necessary accommodation for a public natural history museum, such as is maintained in all the provinces.

After a vote of thanks to the Chairman, a motion to adjourn was adopted. It was decided to hold the next annual meeting at Calgary, during the Convention week of the Agricultural Societies in May.

WILLIAM E. SAUNDERS.

In this issue of our Report, we have pleasure in presenting to our readers a portrait of the Secretary of the Entomological Society of Ontario for the last fifteen years, MR. WM. E. SAUNDERS, who is well known as a prominent member of the fraternity of Canadian Naturalists. Mr. Saunders's home is in London, where he was born and where most of his life has been spent. His father, Dr. Wm. Saunders, Director of the Experimental Farms of the Dominion, has always been devoted to the study of the natural sciences, and hence the son's attention was in early years directed to similar pursuits, interest in them being maintained by the making of collections in the different departments. Geology, Botany, Entomology and Orinthology all in turn provided object lessons for study, training the mind to habits of close observation, and filling the leisure of later years with delightful employment.

After a few years of miscellaneous collecting, Mr. Saunders turned his attention more exclusively to Orinthology, and as soon as the use of a gun was permitted, he commenced a scientifically arranged collection of our native birds, showing male and female in summer and winter plumage, with any variations from the type, also the nest and eggs of each species. Year by year the collection is added to, until now it numbers over one thousand specimens. Mr. Saunders's birds are his intimate friends, and whether in his own house or on the public platform, his "Bird Talks," illustrated with specimens, show to his audience that he speaks of what he has learned by personal experience in the fields and woods. His enthusiasm for this study is such that he counts it no hardship to walk miles into the country in time to hear some favorite songster greet the dawn. He has also been known to spend a night in the woods in the depths of winter, just to see what he missed by spending his nights in bed!

About two years ago, Mr. Saunders accompanied his father on an official visit to Sable Island, a place he had long wished to go to in order to see the only known breeding place of the "Ipswich" sparrow. The impressions of this trip were given to the public in an article in one of our local papers, which has since been adapted for some of our scientific magazines. Mr. Saunders was able also to enrich his collection by several specimens of the rare sparrow, as well as some other beautiful birds, which have their habitat on that interesting island.

Although Mr. Saunders is kept fully employed in looking after his business interests, he finds a change of work sufficient to afford him the rest he needs, hence he has employed his leisure time in many pursuits, and while Ornithology may be called his principal "hobby," he has gone rather extensively into gardening and horticulture generally ; extensively, considering the size of his lot on Central Ave., but the amount of fruit and flowers there produced is a surprise and a pleasure to all his summer visitors. His well known love for these pursuits, and his knowledge of horticulture generally has occasioned his recent election to the chairmanship of the committee who have in charge the care of the street trees in London.

Mr. Saunders received his education principally in London, though two or three years were spent in boy's colleges elsewhere. As it was considered best for him to enter the drug business so long conducted by his father, he was sent for two years to the Philadelphia College of Pharmacy, where he graduated with the highest honours. Soon after his return to London, he was taken into partnership with his father, but on the latter being appointed Director of the Experimental Farms of the Dominion, Mr. Saunders retired from the retail business, and entered the wholesale exclusively.

On the establishment of the Western University he was appointed to the chair of Chemistry, which he held until the claims of his own business forced him to relinguish the position.

EDMUND BAYNES REED.

The older members of the Entomological Society of Ontario will, no doubt, welcome with much pleasure the portrait of **Mr. Edmund Baynes Reed**, which is prefixed to this volume. He was one of the small band who originated the Society on the 16th of April, 1863, and is one of the few survivors who may expect to commemorate its fortieth anniversary a few months hence.

Mr. Reed came to Canada from England when a young man and took up his abode in London, where he for some time practised his profession as a lawyer. Later on he became Secretary-Treasurer of the Synod of the Diocese of Huron and continued to occupy this position till he left London for British Columbia in 1890. He was always devoted to Natural History and especially to the collection and study of insects. His leisure time was largely given up to these pursuits and to the work of the Entomological Society, in which he took the warmest interest. He and Dr. Saunders were instrumental in forming the London Branch of the Society and keeping up the enthusiasm of its members. When the head-quarters of the Society were removed to London and there was in consequence no further need of a Branch, Mr. Reed took an active part in everything that was done and gave most material help in the formation and increase of the library and collections. He was Secretary-Treasurer of the Society in 1871-2-3 and from 1880 to 1886 ; Vice-President in 1874, 1877 and from 1887 to 1889 ; member of the Council from 1874 to 1876 and in 1878 and '79 ; and during many of these years Librarian and Curator in addition. The following extract from the report of the Council for the year ending August 31st, 1890, bears testimony to his usefulness and services :

"In consequence of the removal of Mr. E. Baynes Reed from London to British Columbia, to take charge of the Dominion Meteorological Station at Victoria, it will be necessary to make some new arrangements for the care of the library and collections, and the performance of the official work of the Society. . . . . . . The Council desire to place on record their feelings of deep regret at the removal of Mr. Reed from this Province and the loss which the Society thereby sustains. Mr. Reed is one of the original members of the Society and for more than a quarter of a century has been one of the most active and zealous of its officials, filling at different times the positions of Vice-President, Secretary-Treasurer, Librarian, Curator and Auditor. To him it is especially due that the library has grown to its present dimensions and value, and that so much progress has been made by the Society in many directions. The Council beg to thank Mr. Reed for his services in the past and wish him all possible success and prosperity in his new and important sphere of labour."

Mr. Reed was a constant contributor to the pages of the *Canadian Entomologist* from the very first volume, in which appeared five articles from his pen. His papers, largely collecting notes, records of rare captures, etc., were always interesting and valuable; he also furnished descriptive articles on larvæ, an accentuated list of Canadian Lepidoptera, a report to the Department of Agriculture (jointly with Dr. Saunders) on the Colorado Potato-beetle which had then invaded Western Ontario from the neighbouring State of Michigan, and popular papers on common insects.

In the preparation of the early annual reports of the Society he took a large share and contributed elaborate and valuable papers, as follows: Insects affecting the plum, Report I. (1870), pages 53-63, and Report II. (1871) pp. 22-26; Insects injurious to the potato, *ibid*, pp. 65-81; Insects attacking the cucumber, melon, pumpkin and squash, *ibid*, pp. 89-92; Insects affecting maple-trees, Report III. (1872) pp. 35-43; Insects affecting the peach, *ibid*, pp. 44-47; Insects affecting the potato, *ibid*, 48-50; Some common insects which affect the horse, ox and sheep, Report IV. (1873) pp. 34-41; Entomological contributions, Report V. (1874), pp. 11-16; Sphingidæ—Hawk-moths, Report XII. (1881), pp. 48-70; Diptera—Two-winged flies, Report XIII. (1882), pp. 45-53; and short articles in several issues. From the above list it will be seen that Mr. Reed gave much attention to economic Entomology and did some very excellent work in that department. It was quite fitting, therefore, that he should have been one of the company who, in August 1889, formed the Association of Economic Entomologists and signed its original Constitution.

Another valuable and important work that Mr. Reed performed for the Society was the compilation of a General Index to the first thirteen Annual Reports, 1870-1882, which proved of the greatest use for many years to the members of the Society and others who had occasion to refer to these publications.

For some time before he left London, Mr. Reed took a great interest in Meteorological Observations and in connections with the Observatory at Toronto established a local station and installed the necessary instruments. His anemometer and vanes were placed on the top of the Cathedral tower and connected by wires with his residence on the corner of Park and Queen's Avenues. The work that he thus performed was so accurate and satisfactory that he was selected to take charge of the Pacific Coast Division of the Dominion Meteorological Service, and since 1890 he has continued to fill the office of Superintendent of the Observatory at Victoria, B.C. Though his time is fully taken up with his official duties, he continues to be interested in Entomology and is a member of the British Columbia Natural History Society. His many friends will, no doubt, heartily join with us in the wish that he may enjoy the blessings of health and well-being for many a year to come and retain the vigour and vivacity which have always been his characteristics. C. J. S. B.

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